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EXPORTS IN THE ECONOMIC DEVELOPMENT OF WEST MALAYSIA

by

© JOHN THOMAS THOBURN

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Exports in the Economic Development of West Malaysia" submitted by John Thomas Thoburn in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

ABSTRACT

This thesis analyses the role of primary product exports in promoting economic growth in poor countries, using the tin and rubber industries of West Malaysia as a case study. The study also sheds light on the contribution of "foreign export enclaves" to the growth process since both tin and rubber have important "foreign" sectors.

Export sector effects on development are seen as working through the disposition of export income flows and through technological externalities. A breakdown of the payments made out of current export income shows the proportion of that income initially retained in the domestic economy. This measure is of particular interest for the "foreign" sectors - tin dredging and rubber estates - where there is a presumption that income may be remitted abroad.

In tin dredging at least 70% of current export income is used for local payments. The large proportion is due mainly to high local taxes and export duty payments and to the fact that over a third of dividends now accrue to local residents. Before the Second World War, with no local company tax and few local shareholders (and lower wage payments), the proportion may have been as low as 30%, with large outflows in the form of foreign dividend and foreign tax payments. In the rubber estate sector over 70% of income is retained locally, due principally to the high proportion of wage payments, a proportion which has been relatively constant since before the Second World War.

Both tin dredging and the local sector, gravel pump tin mining, have generated substantial investment opportunities elsewhere in the economy, particularly in electricity supply and petroleum refining. Rubber has encouraged, but to a lesser extent, the local production of chemical fertilizers. Important investment opportunities have also been generated by local purchases of capital equipment by the export industries. This is examined in a separate case study of the most interesting of such "linkage" effects, the development of the Malaysian light engineering industry. Also, it was shown that although a high proportion of export wage earnings is spent locally, they have generated little more than the domestic production of simple foodstuffs.

Tin dredging and gravel pumping have both improved the quality of their labour forces substantially. Rubber has done so to a much lesser extent. Rubber's main contribution to development has been in the provision of large quantities of foreign exchange and in income-earning possibilities for smallholders, rather than in the sort of direct effects generated by tin.

The empirical study is preceded by a survey of the theoretical literature on trade and growth relevant to poor countries.

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ABBREVIATIONS AND NOTES

Abbreviations

SS	Straits Settlements.
FMS	Federated Malay States.
UMS	Unfederated Malay States.
MU	Malayan Union.
FM	Federation of Malaya.
WM	West Malaysia.
KL	Kuala Lumpur (capital of Malaysia).
ABS	Annual Bulletin of Statistics (of WM), published by Department of Statistics, KL.
AR	Annual Report.
ASET	Annual Statistics of External Trade (of WM), published by Department of Statistics, KL.
BSMI	Bulletin of Statistics Relating to the Mining Industry (of WM) published by Department of Mines, KL.
CManI	Census of Manufacturing Industries (of WM), published by Department of Statistics, KL.
CMinI	Census of Mining Industries (of WM), published by Department of Statistics, KL.
DRC	Dry Rubber Content.
ECAFE	Economic Commission for Asia and the Far East (United Nations).
FFB	Fresh Fruit Bunches (of oil palm).
FIDA	Federal Industrial Development Authority, KL.

FLDA	Federal Land Development Authority, KL.
FSLC	Report on the Financial Survey of Limited Companies Malaysia 1967, published by Department of Statistics, KL.
HBS	Household Budget Survey (of FM) 1957, published by Department of Statistics, KL.
HLS	Handbook of Labour Statistics (of WM), published by Ministry of Labour, KL.
MBS	Monthly Bulletin of Statistics (of WM), published by Department of Statistics, KL.
MIC	Malaysia Industrial Classification.
MID	Malaysia Industrial Digest, published by FIDA.
MTC	Malaysia Trade Classification.
OPCTS	Oil Palm, Coconut and Tea Statistics (of WM), published by Department of Statistics, KL.
RRIM	Rubber Research Institute of Malaya, KL.
RSH	Rubber Statistics Handbook (of WM) published by Department of Statistics, KL.
RSS	Ribbed Smoked Sheet (rubber).
SCI	Survey of Construction Industries (of WM), published by Department of Statistics, KL.
SMR	Standard Malaysian Rubber.
SManI	Survey of Manufacturing Industries (of WM) published by Department of Statistics, KL.
USS	Unsmoked Sheet (rubber).

Symbols used in Tables

...	not available
-	zero or negligible
*	estimated

Numbering of Tables, Sections, and Subsections

Table, section, and subsection numbers are prefixed with a large Roman numeral which indicates the chapter number in which they occur (e.g. Table IV - 3 and Subsection IV - 3ii are in Chapter IV). When reference is made in the text to a table, section or subsection in the same chapter, the prefix is dropped (e.g. the text of Chapter IV refers to Table 3, Subsection 3ii, etc.)

Weights

Pikul = 133.3 lbs. (16.8 pikuls = 1 long ton)

Kati = 1.3 lbs. (100 Katis = 1 pikul)

Currency

Unless otherwise stated, the dollar sign ($) refers to the Malaysian dollar. ($1 = £0.14 = US$0.33 = C$0.34).

CHAPTER I

INTRODUCTION

Section I - 1 Scope and Nature of the Study

This work is a case study of the role of primary product exports in promoting economic growth in poor countries.[1]

In the late nineteenth and early twentieth centuries many countries experienced rapid rises in primary product exports.[2] In most cases these exports remain important to the present day. Some of the countries, such as Canada and Australia, now have high levels of per capita income. Others experienced much less economic growth and are still regarded as "underdeveloped," although within the "underdeveloped" group many disparities exist in relative growth performance. It has been contended that rapid export growth in poor countries has led to the existence of export industry "enclaves," which have not, and cannot, spread development into the rest of the domestic economy. Such a view has implications both for the interpretation of past experience and for the formulation of present policy.

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[1] In this work the term "economic growth" means sustained rises in per capita income, unless otherwise stated.

[2] These countries are sometimes known as the "periphery" countries. The contrast is with the countries of the "centre," such as the United Kingdom, France and Germany, which had already achieved a substantial degree of industrialization and growth.

The relation between exports and economic growth in poor countries can be tested in aggregative terms using cross-sectional studies involving a large number of countries.[1] Another approach is the case study of individual exports in a particular country. What case studies lose in generality they gain in depth. For the present case study, West Malaysia has been chosen, and the study concentrates on the effects of tin and rubber exports. East Malaysia[2] is not included because there are almost no data on that region.

West Malaysia is one of the richest countries in Asia, after Japan.[3] Exports in 1966 constituted 48% of Gross National Product at factor cost,[4] and rubber and tin accounted for over two-thirds of export earnings.[5]

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[1] References to such studies are given in Chapter II. The present chapter does not give references to empirical or theoretical work, which is discussed at length in Chapter II.

[2] Sabah and Sarawak on the island of Borneo.

[3] In 1966, the latest year for which Malaysian national account figures are available, per capita GNP at market prices in West Malaysia (U.S. $316) was exceeded in the East and South-East Asia region only by Japan (U.S. $1027), Singapore (U.S. $616) and Sabah in East Malaysia (U.S. $331). These figures compare to an average of U.S. $190 (U.S. $120, excluding Japan) for the region as a whole in 1965 (the latest year available). Of course, such national income statistics should be treated with caution, but they appear to indicate differences in orders of magnitude. See United Nations, Statistical Yearbook 1969, (New York, 1970), p. 564.

[4] National Accounts of West Malaysia, 1960-66.

[5] In 1966 rubber exports were 44.7% and tin exports 25.4% of total export earnings. Other important exports were iron ore (4.4%), palm oil and kernels (4.1%) and timber (3.2%). See MBS, June 1970. (MBS and other abbreviations are explained in the Abbreviations and Notes to this study). Iron ore exports are likely to decline in the future as deposits and Japanese export demand declines. Palm oil and timber exports are increasing. Also becoming important are exports of machinery and transport equipment and of chemicals (2.1% and 1.7% of 1968 exports, respectively - MBS June 1970).

Thus the country seems an obvious choice for a case study. Moreover, most of its documentary material is in English. Tin and rubber represent two types of primary exports - plantation products and minerals - much discussed in the theoretical literature. The third major type of primary export, products of peasant agriculture, is represented by smallholder rubber. Tin exports are still at a level comparable to that reached during the initial expansion of the industry (from the 1880's to the 1929 Depression) and rubber exports are now much greater than in the early rubber boom years (1905-22).[1]

The form which export expansion took is important for an analysis of its effects. In Malaysia tin exports were developed by immigrants from China, and later also by Europeans[2] using Chinese labour. The rubber estate sector was developed by Europeans, who imported most of their labour from India. In both cases an export sector was grafted, as it were, on to a domestic economy, although the development of rubber estates was rapidly followed by the entry of local people (Malays) into the industry as smallholders. An important difference, however, between Chinese and European enterprise was that in the former case capital came mainly from within Malaya,[3] while European capital came mostly from the United Kingdom. European enterprise was therefore more of the nature of foreign direct investment as it is known today than

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[1] For time series of tin and rubber output see Appendices IV-1 and V-1, respectively.

[2] In this study the term "European" includes people from North America and Australasia as well as from Europe.

[3] From the Chinese merchant communities of Singapore, Penang, and Malacca.

were the Chinese ventures.[1] By the 1920's the basic structure of the export sector as it exists today was already formed: tin was split into a Chinese (gravel pumping) and a European (dredging) sector, and rubber was divided between (mostly) European estates and (mostly) Malay smallholdings. It is of interest to compare the effects of exports on development then with what they are now.

In this study export sector effects on development are seen as working through the disposition of export income flows, and through technological externalities. Export expansion provides opportunities for domestic investment either directly in exports, in industries supplying or supplied by the export sector, or in industries supplying export factors' final demand needs. It also may improve the quality of the labour force and introduce new technology into the economy. Therefore a large part of the research on the two main export commodities is directed towards breaking down into constituent parts the payments (to profit receivers in Malaysia and overseas, to workers, to suppliers, to governments, etc.) made out of export income. The method is to concentrate on the present day, since data for the present are more easily available, and to work back into time. In both industries it has been possible to work back at least to the later parts of their early periods of expansion.

The work is organized as follows. Chapter II surveys theories of trade and growth applicable to poor countries. It includes a discussion of Classical theories of trade and growth and of the "staple" growth

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[1] One effect of this difference is that a much larger proportion of European profits would be remitted to the U.K. than would Chinese profits to China.

theories applied to Canada and later to the U.S.A. Chapter III draws on the material in Chapter II to set out a framework of analysis for the rest of the study. It also discusses some conceptual problems. Chapters IV and V, on tin and rubber respectively, form the core of the study. Both these chapters are started with an extended introduction which explains the technological aspects of export production and how the industry was established and developed. Chapters IV and V include analyses of payments made on capital account as well as on current account. Chapter VI examines technological externalities. Chapter VII analyses final demand purchases made by export sector factors of production and estimates export multipliers. Chapter VIII is a case study of an important industry - light engineering - whose existence appears to be owed to capital purchases by the export sector. The material for the body of this chapter was collected by primary fieldwork in Malaysia, from October to December 1970. Although tin and rubber are the main objects of interest in this study, some material on oil palm is introduced, mainly for comparative purposes, particularly in Chapters VI and VIII.

It is hoped that the finding of this study will have an application outside as well as inside Malaysia. Malaysian experience may provide a guide to the development of other small countries highly dependent on primary product exports. From the viewpoint of policy formation the study has several uses. It gives a clearer picture of the sort of pecuniary and technological externalities which could be incorporated into investment appraisals of primary product export

projects,[1] and of the potential role of primary product exports in development. It also throws light on the role of foreign direct investment.[2] Thus it will be shown that the present outflow of profits from foreign export firms is quite small in relation to their local payments.

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[1] For instance, the substantial externalities generated by both sectors of the tin industry suggest that an even higher priority should be given to prospecting for new tin deposits offshore and in Malay Reservations than is already indicated by the high rate of return on tin investment (See Chapter VI for a discussion of rates of returns.)

[2] Foreign direct investment should not necessarily be equated with the activities of multinational corporations, which at present are a fashionable topic of discussion. Very few of the European firms in Malaysia are multinational. Although some tyre manufacturers (Dunlop and Goodyear, for instance) own rubber estates, while Unilever owns oil palm estates and Rio Tinto Zinc has recently moved into tin dredging, most European firms were floated specifically to carry out their present activities and have few interests outside Malaysia. The large agency houses, such as Guthries, with interests in the export sector, were likewise formed locally (in Singapore). In domestic manufacturing, however, multinational corporations (Shell, Esso, ICI, Dow Chemicals, etc.) are active.

Section I - 2 Background Information on West Malaysia

This section is intended as a brief factual introduction for readers unfamiliar with Malaysia.

West Malaysia is situated in South East Asia on the southermost part of a peninsula below Thailand and Burma, bounded on the east by the South China Sea and on the west by the Straits of Malacca. The country is less than 500 miles north-south and 200 miles east-west at its widest point. The southern tip of West Malaysia is only a degree of latitude north of the equator. Average daily temperature is 85° to 90°F. with little seasonal variation, and rainfall is heavy (100" per year on average).[1] The east coast is subject to heavy monsoon rains from November to March, while rainfall on the west coast is relatively even. A Central Range of mountains separates the western and eastern parts of the country, except in the southern states. Over four fifths of the land area is covered by forests or swamps.[2] It is estimated that there is under forest at present almost as much land suitable for agricultural development - about 6 million acres - as is already cultivated.[3]

Malaysia is an independent country within the British Commonwealth, with its own king, the Yang di-Pertuan Agong. The country is a federation of eleven states in West Malaysia, while Sabah and Sarawak on

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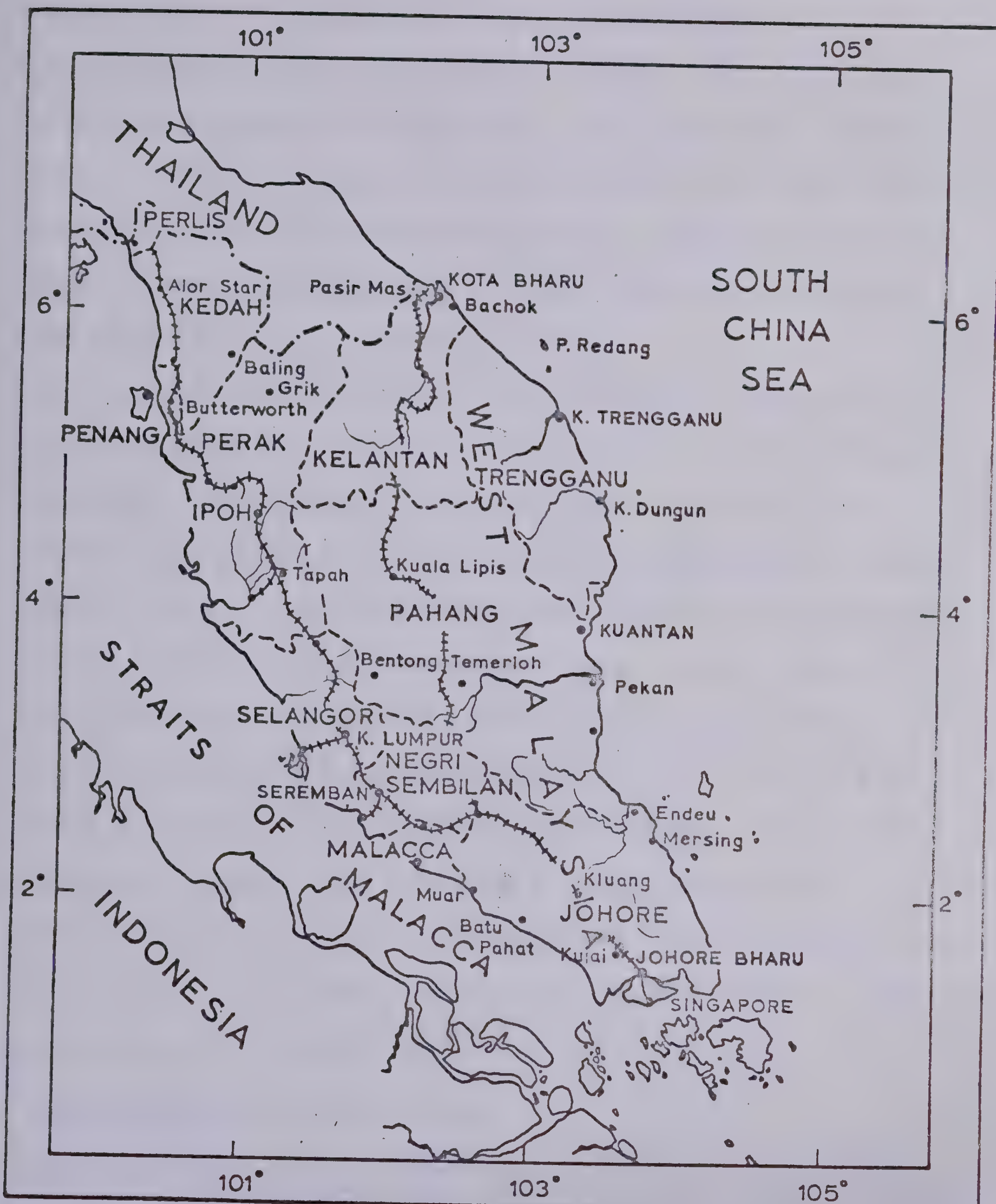
[1] Straits Times, Malaysia Yearbook 1970 (Kuala Lumpur, 1970), p. 12.

[2] *Ibid*, p. 10.

[3] K. Sargent, "Forestry Development in Malaysia," talk given to the Faculty of Agriculture, University of Malaya, Kuala Lumpur, December 1970.

8.

WEST MALAYSIA



the island of Borneo are the two states of East Malaysia. The West Malaysian states are (from north to south) Perlis, Kedah, Penang, Perak, Selangor, Negri Sembilan and Malacca on the west coast; and Kelantan, Trengganu and Pahang on the east coast. The southernmost state is Johore. Individual states have their own rulers and certain rights, particularly the right to alienate new land. Malaysia was formed in 1963 out of the former Federation of Malaya together with Singapore, Sabah and Sarawak. Singapore left in 1965.[1]

From its early development to its independence ("Merdeka") in 1957, the country was under the influence of the British. Already established in the "Straits Settlements" of Penang, Malacca, and Singapore,[2] British control was extended to the Malay Peninsula proper in 1874. In that year the Sultan of Perak accepted under the Pangkor treaty a British adviser, or "Resident", whose advice he was bound to accept on all matters except Malay custom and religion. This form of indirect rule was soon extended to other Malay states, and in 1895 the Federated Malay States were formed, comprising Perak, Selangor, Negri Sembilan and Pahang. Soon after, all states in the Malay Peninsula were under British control, Perlis, Kedah, Kelantan, and Trengganu having been ceded from Siam. The whole area was known as British Malaya, comprising

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1 Malaysia Yearbook, op.cit. p. 31.

2 Also included in the Straits Settlement for a time was a coastal area known as the Dindings, later incorporated into Perak. Penang included Province Wellesley on the mainland, and Singapore included Christmas Island, Labuan island, and Cocos Island.

the States Settlements, the Federated Malay States (FMS) and the Unfederated Malay States (UMS). Only the Straits Settlements were under direct rule.[1]

At the time of British intervention in 1874 the country was almost entirely covered in jungle, with settlement confined to river banks, and the Chinese mining area of Larut in Perak. Large scale Chinese immigration dates from this time, and was largely in response to opportunities in tin mining.[2] Indian immigration dates from the development of rubber in the 1910's. The present population of West Malaysia is 8.9 million of whom 50% are Malays, 36% Chinese, and 11% Indian.[3] Malay is the country's national language ("Bahasa Malaysia"). English also is widely used, as well as Chinese[4] and the South Indian language, Tamil.

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[1] For an early account of the Development of British influence see Sir Frank A. Swettenham, British Malaya. An Account of the Origin and Progress of British Influence in Malaya (London, 1907). Swettenham was one of the most influential of the early British administrators, and was first Resident-General of the FMS.

[2] For an account of the overseas Chinese in Malaya see V. Purcell, The Chinese in Malaya, (London 1947). A history written more from the Malay viewpoint is Sir Richard O. Winstedt, A History of Malaya, (Third edition, Kuala Lumpur, 1968.)

[3] These are 1969 figures, from MBS June 1970. In ordinary Malaysian usage these groups are known as "races". This usage is adopted in this study.

[4] The main Chinese dialects spoken in Malaysia are Hokkien, Hakka, and Cantonese. Hokkien and Cantonese are dialects of southern China. The Hakka dialect does not properly belong to any one region of China, but most Hakka people in Malaysia do in fact come from southern China too.

British Malaya was invaded by the Japanese in December 1941 and occupied until September 1945. The country was reorganised after the war into a Malayan Union, replaced by a Federation of Malaya in 1948, comprising the whole of British Malaya except Singapore. From 1948 to 1960, a state of "Emergency" was in force, while government and Commonwealth forces put down a communist insurrection.

TABLE I - 1 GROSS DOMESTIC PRODUCT AND WORKFORCE BY SECTOR, WEST MALAYSIA, 1965

	% OF GDP	% OF WORKFORCE
Agriculture, Forestry and Fishing	28.6	55.1
Rubber Planting	14.8	28.4
Agriculture and Livestock	10.5	)
Forestry and Logging	1.3	) 26.7
Fishing	2.0	)
Mining and Quarrying	8.7	2.4
Manufacturing	10.2	6.9
Construction, Utilities and Transport	10.1	8.3
Public Administration and Defence	7.2	10.2
Other Services	15.2	17.0
Gross Domestic Product (at factor cost): $6844 million		Working Population: 2.5 million

Sources and Notes: 1) GDP figures from National Accounts of West Malaysia 1960-66. Employment figures from First Malaysia Plan 1966-70 (Kuala Lumpur, 1965), p. 53, except for rubber and other agriculture.
2) GDP figures are not given for Wholesale and Retail Trade markups (15.6%) and Onwership of Dwellings (4.4%).
3) Rubber estate labour force from Appendix V - 2. Smallholder labour force estimated at 445,000 from C. Barlow and Chan Chee Kheong "Towards an Optimum Size of Rubber Holding," (Natural Rubber Conference Kuala Lumpur, 1968, preprint), pp. 6-7. Workforce in the rest of agriculture calculated as a residual from rubber.

Table 1 shows gross domestic product and workforce by sector. Comparing sectoral percentages of GDP and workforce gives an indication of differences in labour productivity between sectors.[1] Thus while over half the working population is employed in agriculture, only just over a quarter of GDP is generated by that sector. In contrast, manufacturing and more especially mining and quarrying have very high labour productivities. Non-estate rubber planting and other agriculture, which is mostly padi (rice) growing, are principally Malay activities, although Chinese and Indian are also important as rubber smallholders. Tin mining, manufacturing, and to a lesser extent rubber production, are concentrated in the west coast states, which have over 80% of total population and a higher standard of living than the east coast. Padi planting is especially important on the east coast and in the northern states of Kedah and Perlis.

Economic policy has been expressed in a series of five year plans, starting from 1950.[2] Plans consist of macro-economic projections and targets, combined with public expenditure allocations and discussions of policy towards the private sector. The major problems faced by Malaysian planners are two. First, population has been growing at a

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[1] For a comparative discussion of the structure of underdeveloped countries in terms of sectoral productivities, etc., see S. Kuznets, Modern Economic Growth. Rate, Structure and Spread (London, 1966), especially Chapter III.

[2] FM, Draft Development Plan (for 1950-55) (Kuala Lumpur, 1950); FM, First Five Year Plan, 1956-60 (Kuala Lumpur, 1956); Second Five Year Plan, 1961-65 (Kuala Lumpur, 1961); and First Malaysia Plan, 1966-70 (Kuala Lumpur, 1966). At the time of writing (June 1971) the Second Malaysia Plan, for 1971-75, is expected to be published shortly.

rate of 3% per annum in recent years,[1] and necessitates a rapid increase in employment opportunities. Second, there are large and apparently growing inequalities in income distribution.[2] These fall along racial grounds to a considerable extent, with rural Malays forming one of the poorest sections of the community together with the urban unemployed. The political need to remove disparities and cope with growing unemployment has been heightened by the serious racial disturbances which took place in Kuala Lumpur and elsewhere on and after 13th May 1969, when fighting broke out between Malays and Chinese following an acrimonious national election compaign fought on racial lines.[3]

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[1] It has been over 2% ever since the Second World War, rising to a maximum of 3.5% in 1956. See MBS June 1970.

[2] Professor T.H. Silcock in a survey of Malaysian policy suggested two more major problems: instability (of export earnings) and balance of payments difficulties. Although the former makes for planning difficulties it is difficult to see why it should be elevated to a position of key importance. The balance of payments is discussed below. See "General Review of Economic Policy", in Silcock and E.K. Fisk (editors), The Political Economy of Independent Malaya. A Case Study in Development (Berkeley, 1963). For a more recent discussion of policy see Sumitro Djojohadikusumo, Trade and Aid in South-East Asia, Volume 1, Malaysia and Singapore (Melbourne, 1968), Chapter VIII.

[3] See National Operations Council, The May 13 Tragedy. A Report (Kuala Lumpur, 1969); and Tunku Abdul Rahman Putra al-Haj, May 13. Before and After (Kuala Lumpur, 1969).

Malaysia has been successful in maintaining a rate of increase in gross national product in excess of population growth.[1] Investment has been raised from just over 10% of GNP to nearly 20% over the ten years to 1965, and has been maintained at least to 1968. Savings have been raised to within a percentage point of investment, so that no savings gap has emerged. GNP growth was accompanied by rapidly growing export earnings for the 1956-60 and 1965-68 periods, while rises in public expenditure provided the main growth stimulus during the 1961-65 period.[2] No serious balance of payments difficulties have yet arisen, but projected import needs are likely to outpace export increases. It is envisaged that this problem will be solved in the short-run by import substitution and in the long run by diversification into new exports, both primary products and manufactures.[3]

In the public expenditure field, the government has concentrated on providing infrastructure, particularly transport, and on rural development. Rural development has taken two main forms: irrigation projects for rice such as the Muda River Scheme in Kedah, and land development, particularly under the Federal Land Development Authority. In the private sector attention has focussed on attracting foreign capital through tax concessions, tariff protection, and investment in infrastructure and industrial estates. In the long term, the 1965-85

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[1] GNP at current prices corrected for changes in the terms of trade rose annually by 5.0%, 1965-68, (including East Malaysia), and 5.8% from 1960-65 (including East Malaysia). From 1955 to 1960 real output grew at only 4% in Malaya. See <u>First Malaysia Plan</u>, <u>op.cit</u>, pp. 18-19.

[2] See <u>ibid</u>, pp.20-30, and <u>Mid-Term Review of the First Malaysia Plan 1966-70</u>, (Kuala Lumpur, 1969) pp. 4-6.

[3] In fact export performance during the 1965-68 period was much better than expected, especially because of increases in oil palm, timber and tin exports, which counterbalanced falls in the rubber price. See <u>ibid</u>, p. 4.

Perspective Plan envisages considerable agricultural diversification away from rubber, and a lowering of population growth to 2% per year by birth control campaigns.[1] In the latest Mid Term Review long run policy has been further elaborated,[2] with considerable stress laid on natural resource development. A speeding up of the rate of land development by public schemes and by a new involvement of the private estate sector is envisaged. Intensified mineral surveys (especially for tin), development of forest based industries, further growth in palm oil production, and a major extension of the range of rubber products made locally are also important. It is recognized that no developing country can long maintain its GNP growth rate well in excess of its export growth rate[3] and vigorous export promotion is called for. Need also exists for developing financial institutions to channel domestic savings into private and public investment. The planners express a belief that with appropriate policies, Malaysia's natural resources (especially undeveloped land) could be used to raise per capita income within one generation to that of a "developed" country, while incorporating the rural poor into the modern sector.[4]

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[1] See First Malaysia Plan, op.cit. pp. 14-17.

[2] Op.cit. pp. 38-43.

[3] Ibid. p. 41.

[4] Ibid, p. 38. The modern sector in this context must be taken to include Federal Land Development Authority schemes, whose settlers are mainly Malays. The FLDA is discussed further in Chapter V.

CHAPTER II

THEORIES OF GRADE AND GROWTH

This chapter surveys theories of trade and growth which shed light on the role of export expansion in underdeveloped countries. First, in Section 1, references to trade and growth made by Classical writers are collected, and their views summarized. In Section 2 the so-called "staple" theory of growth is discussed, a theory designed originally to explain economic growth in Canada through the expansion of resource-intensive exports. The chapter is searching primarily for theoretical discussion of the mechanisms through which trade promotes growth, and staple theories are a good source of such discussion. Finally, in Section 3, theories of trade and growth in poor countries are presented. Marxian and "enclave" views of export growth are outlined and criticised and other explanations of limited development through exports are discussed. The relation of dualistic theories of development to trade and growth is set out, together with macro trade and growth models. The section concludes with trade policy for development.

Section II-1 Classical Theories

Although the Classical theories of trade which are most famous are those which treat trade as a static reallocative mechanism - exemplified in the Ricardian theory of comparative advantage[1] - references to trade and growth also can be found in the writings of Classical economists, particularly John Stuart Mill. These writings deal with three aspects of the problem: first the general causal connection between trade and growth; second, the relevance of trade for the growth problems of the advanced countries of the time;[2] third, in Mill, the ways in which trade may initiate growth in underdeveloped countries. Only the first and third of these aspects are the concern of this chapter. The views of Smith and Mill, the major Classical writers on trade and growth are

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1 One might note that, before Ricardo, Adam Smith had presented a static theory which explained trade in terms of absolute advantage. See An Enquiry into the Nature and Causes of the Wealth of Nations (First edition 1776. Modern Library edition, New York, 1937) Book IV, Ch. II, pp. 420-439.

2 This mainly concerns trade as an offset to diminishing returns to land. Indeed, it is in this sense that D.H. Robertson, in his famous article, "The Future of International Trade", Economic Journal, March 1938, refers to trade as an "Engine of Growth". This often misquoted description actually means that trade was an engine of growth for England and similar countries, and does not refer to the countries exporting to England.

presented first. Ricardo's work is also examined since he is the most widely known classical trade theorist. Also, the section looks at the references to trade and growth to be found in Marshall. These views are then evaluated, and a final section deals with some modern economists who have written on the subject in the Classical tradition.[1]

II - 1i Smith

Smith's views are contained in his chapter "On the Principle of the Commercial or Mercantile System" in the Wealth of Nations and are well summarized in the following passage:

> "The importation of gold and silver is not the principal, much less the sole benefit which a nation derives from its foreign trade. Between whatever places foreign trade is carried on, they all of them derive two distinct benefits from it. It carries out that surplus part of the produce of their land and labour for which there is no demand among them, and brings back in return for it something else for which there is demand. It gives a value to their superfluities, by exchanging them for something else, which may satisfy a part of their wants, and increase their enjoyments. By means of it, the narrowness of the home-market does not hinder the division of labour in any particular branch of art or manufacture from being carried to the highest perfection. By opening a more extensive market for whatever part of the produce of their labour may exceed the home consumption, it encourages them to improve its productive powers and to augment its annual produce to the utmost, and

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[1] The expression "Classical tradition" here refers to the tendency of Classical economists to discuss trade and growth in very general terms, in contrast to recent discussions which have focused on the mechanisms through which growth may be transmitted through the export sector. The modern "Classical writers" are usually what E.J. Mishan has called the "elder statesmen type of economist", and include Gottfried Haberler and J.R. Hicks.

> thereby to increase the real revenue and wealth of the society. These great and important services foreign trade is continually occupied in performing, to all the different countries between which it is carried on."[1] [2]

And again, speaking of the discovery of America:

> "by opening a new and inexhaustable market to all the commodities of Europe, it gave occasion to new divisions of labour and improvements of art, which, in the narrow circle of the ancient commerce, could never have taken place for want of a market to start off the greater part of their produce. The productive powers of labour were improved, and its produce increased in all the different countries of Europe, and together with it the real revenue and wealth of the inhabitants."[3]

There are two notions here. First, what Mill has called the "Vent for Surplus" principle, and second, a dynamic productivity theory of trade.[4] The productivity theory is a theme running through all the Classical trade and growth writings and is examined in the evaluation of Classical theories in Subsection 1vi of this chapter. Finally, in another passage Smith notes that the division of labour occasioned by trade has a regional aspect:

> "Since such, therefore, are the advantages of water - carriage, it is natural that the first improvements of art and industry should be made where this conveniency opens the whole world for a market to the produce of every sort of labour, and that they should always be much later in extending themselves into the inland parts of the country."[5]

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[1] Op.cit., p. 415.

[2] Cited also by H. Myint, "The 'Classical Theory' of International Trade and the Underdeveloped Countries", Economic Journal, June 1958.

[3] Smith, op.cit., p. 416.

[4] Myint, op.cit., p. 318.

[5] Smith, op.cit., p. 19.

This conclusion is in part due to the slow standard of the inland transport of Smith's day, but it approximates to the situation which prevailed when many underdeveloped countries, including Malaya, were opened up to trade.

II - 1ii Ricardo

Ricardo's interest in trade was primarily concerned with the static gains from trade described in terms of comparative advantage, and his work on trade and growth is meagre. However, certain passages in the Principles[1] suggest his views on trade and growth. Thus:

> "Foreign trade .... (is) highly beneficial to a country, as it increases the amount and variety of the objects on which revenue might be expanded, and affords, by the abundance and cheapness of commodities, incentives to savings and to the accumulation of capital."[2]

II - 1iii Mill

Of all the Classical economists, Mill wrote the most extensively on trade and growth. Chapter 17 of Book III of his Principles,[3] "Of

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1 D. Ricardo, The Principles of Political Economy and Taxation, (First edition, 1817. Page numbers refer to Modern Library edition, London, 1962).

2 Ibid., p. 80. He contends however that these effects do not necessarily occur through a rise in the rate of profit. Profits can only rise if wages fall, and wages can only fall if the cost of wage goods also falls. Trade will not increase the rate of profit unless it brings about a cheapening of wage goods. Hence trade stimulates capital accumulation by increasing the willingness of capitalists to save and invest at a given rate of profit.

3 Principles of Political Economy with Some of their Applications to Social Philosophy (London 1848. Page numbers refer to Longman's 1900 edition).

International Trade" contains his clearest statement of the general causal connections. He first discusses the direct gains from trade which he considers, following Ricardo, to consist of getting imports at lower real costs. But there are also indirect benefits of trade which must be counted as benefits of a higher order:

> "One is the tendency of every extension of the market to improve the processes of production. A country which produces for a larger market than its own, can introduce a more extended division of labour, can make greater use of machinery, and is more likely to make inventions and improvements in the processes of production. Whatever causes a greater quantity of anything to be produced in the same place, tends to the general increase of the productive powers of the world. There is another consideration, principally applicable to an early stage of industrial advancements. A people may be in a quiescent, indolent, uncultivated state, with all their tastes either fully satisfied or entirely undeveloped, and they may fail to put forth the whole of their productive energies for want of any sufficient object of desire. The opening of foreign trade, by making them acquainted with new objects, or tempting them by the easier acquisition of things which they had not previously thought attainable, sometimes works a sort of industrial revolution in a country whose resources were previously undeveloped for want of energy and ambition in the people: inducing those who were satisfied with scanty comforts and little work, to work harder for the gratification of their new tastes, and to save, and accumulate capital, for the still more complete satisfaction of those tastes at a future time."[1]

Mill considers even these economic advantages of commerce to be surpassed by its "intellectual and moral effects":

> "it is hardly possible to over-rate the value, in the present low state of human improvement, of placing human beings in contact with persons dissimilar to themselves, and with modes of thought and action unlike those with which they are familiar. Commerce is now, what War once was, the principle source of this contact. Commercial adventurers from more advanced countries have generally been the first civilisers of barbarians. And commerce is the purpose of the far greater part of the communications which takes place between civilized nations. Such communication has always been, and is peculiarly in the

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[1] Ibid., p. 351.

present age, one of the primary sources of progress."[1] Clearly, such "civilising" is part of the process of economic development.

It is interesting to compare Mill's general presentation of the indirect gains from trade with his discussion of the development possibilities of Asian countries. In Book I he discusses laws of increases of labour and capital and in Chapter 13 he goes on to consider the consequences of these laws. There are two limits to the increase in production: deficiencies of capital and of land. The former operates where there is not a sufficient affective desire to accumulate capital. The latter operates when the limited land at the disposal of the community does not permit additional capital to be employed at a rate of return sufficient to satisfy investors.[2] In England it was the tendency of returns to a progressive diminution which might in time put an end to the increase in production, but in the countries of Asia it was the principle of accumulation itself which was weak:

> "where people will neither save, nor work to obtain the means of saving, unless under the inducement of enormously high profits, nor even then if it is necessary to wait a considerable time for them: where either productions remain scanty, or drudgery great, because there is neither capital forthcoming nor foresight sufficient for the adoption of the contrivencies by which natural agents are made to do the work of human labour."

Such countries need, says Mill an increase in industry and in the effective desire of accumulation. He lists four means of remedying the situation:-[3] first, better government, which gives more complete

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[1] Ibid., p. 351-2.

[2] Note that trade could offset diminishing returns here. See Robertson, op.cit.

[3] Mill, op.cit., p. 117.

security of property; moderate taxes and freedom from arbitrary exaction under the name of taxes; and more permanent and advantageous land tenure to secure the cultivator the benefits of his industry. Second is improvement of the public intelligence. This means the decay of usages of superstitions interfering with the effective employment of industry, and the growth of mental activity, making the people alive to new objects of desire. Third, is the introduction of foreign arts. These raise the rates derivable from additional capital, to a rate corresponding to the lower strength of the desire to accumulate. Fourth, is the importation of foreign capital. This renders the increase in production no longer dependent exclusively on the thrift of the inhabitants, while it places before them a stimulating example, and by instilling new ideas and breaking the chain of habit, if not by improving the actual condition of the population, tends to create in them new wants, increased ambition, and a greater thought for the future. It is clear that these determinants can be tied in closely with the indirect benefits from trade, particularly if export growth is financed by direct foreign investment. The introduction of foreign technology increases the effectiveness of the division of labour associated with market expansion. Imports may stimulate new desires, and profit opportunities from exporting may strengthen the wish to accumulate. Moreover, the introduction of foreign capital has often been accompanied by foreign political control, which whatever its other merits and defects, often increased security of property.[1]

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[1] For example, in Malaya the extension of British political control to the Malay states increased freedom from arbitrary expropriations of property by the aristocracy and abolished eventually the institution of debt-slavery.

Finally, the concept of foreign enclaves was recognized by Mill:

> "There is a class of trading and exporting communities, ... (which) .... are hardly to be looked upon as countries, carrying on an exchange of commodities with other countries, but more properly as outlying agricultural or manufacturing establishments belonging to a larger community. Our West India colonies, for example, cannot be regarded as countries, with a productive capital of their own. .... (they) are the place where England finds it convenient to carry on the production of sugar, coffee, and a few other tropical commodities. All the capital employed is English capital; almost all the industry is carried on for English uses; there is little production of anything except the staple commodities, and these are sent to England, not to be exchanged for things exported to the colony and consumed by its inhabitants, but to be sold in England for the benefit of the proprietors there. The trade with the West Indies is therefore hardly to be considered as external trade, but more resembles the traffic between town and country, and is amenable to the principles of the home trade."[1]

II - 1iv <u>Marshall</u>

Marshall's work contains many statements of the nature and operation of forces causing or facilitating economic development.[2] Youngson divides these forces into three categories: fundamental determinants of growth, major influences on growth, and minor influences. We examine here the extent to which foreign trade can be associated with certain of these. The fundamental determinants are

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[1] <u>Ibid.</u>, pp. 414-5.

[2] An excellent survey of these forces is in A.J. Youngson, "Marshall on Economic Growth", <u>Scottish Journal of Political Economy</u>, February 1956. Youngson, however, does not concern himself very much with the problem of trade and growth as such, but his article is a convenient background against which a discussion of Marshall can be set.

mainly non-economic. They are climate, natural resources, human character, and human freedom. Marshall considers that, among these, contact with the sea (and therefore foreign trade) is important as it provides man with the possibility of constant intercourse, knowledge, freedom and the power of variation.[1]

Two of the major influences, which are all primarily economic, stand out as being particularly important. The first of these is the willingness and ability to save, and the second is the growth of "massive production". The influence of trade on the former was discussed extensively by Mill, but there is no reference in Marshall which deals explicitly with this connection. Massive production depends on the growth of markets and therefore can be associated with foreign trade. Thus Marshall states that British export trade has exercised a quiet but constant influence on the development of improved methods and increased economies of scale;[2] and again the development of an export, say cloth manufacture, can lead to external economies such as the development of mechanical appliances, division of labour, and better organization of transport.[3]

The minor influences on growth include the desirability of having a middle class to purchase articles of solid and lasting utility, so providing a market for massive production, but Marshall does not discuss this influence in relation to trade.

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[1] A. Marshall, Principles of Economics: an Introductory Volume (London 1890) Book I, Chapter II, Section I (See appendix A in VIIIth edition, 1920); and Youngson, op.cit., p. 2.

[2] Money, Credit and Commerce, (London, 1923) p. 351.

[3] Ibid., p. 352.

II - 1v Evaluation of Classical Theories

Three main aspects of the effects of trade on growth can be seen. First, the vent for surplus principle outlined by Smith. Second, the scope which access to international markets gives to extending the division of labour and promoting technological innovation. Third, the stimulus given to saving and investment by profit opportunities in exports and new consumption possibilities from imports.

Vent for surplus is not a truly dynamic theory of trade and growth. Indeed it may be interpreted as the extreme case of differences in comparative costs,[1] although Mill discussed it as one of the last vestiges of mercantilism in Smith's Wealth of Nations.[2] It is mentioned here because it has been developed and used by Hla Myint as an explanation of limited growth following export expansion in certain South East Asian countries. This is dealt with in Section 3iii.

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[1] G. Haberler, International Trade and Economic Development, National Bank of Egypt 50th Anniversary Commemoration Lectures, (Cairo, 1959), reprinted in J.A. Pincus, Reshaping the World Economy. Rich and Poor Countries, (New Jersey, 1968), (Page numbers refer to Pincus.) This assumes domestic mobility of factors of production. J.H. Williams has argued that many of the factors employed in exports were created by international trade itself and stand committed to it. Without trade, they might well be unemployed or have to migrate abroad. See "The Theory of International Trade Reconsidered", Economic Journal, June 1929, pp. 264-5.

[2] Principles, op.cit., p. 350. Mill wished to replace it with what he regarded as a more sophisticated version of trade in terms of comparative advantage.

Increased division of labour resulting from an enlarged (export) market was first outlined by Smith, but the form the increased division of labour might take was modified by Mill. Smith conceived three reasons why division of labour should yield increasing returns:[1] a) by reducing man's task in the production process to a simple operation his dexterity is increased; b) time can be saved which was formerly taken up in passing from one task to another; c) the specialisation of workmen on single tasks makes it more likely that they will invent machines to do their tasks more effectively. Smith states that a great part of the machines used in manufactures in which labour is most subdivided were originally the invention of common workmen. Smith does admit that new processes also may be devised by "machine makers and philosophers" and that the division of labour operates among these two. Thus, for Smith, the division of labour consists mainly of the splitting up of occupations and the development of specialised crafts. Mill notes that the division of labour also permits greater use of machinery, and later writers have argued that it is this which is the crucial aspect.[2] The

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[1] Wealth of Nations, op.cit., pp. 7-10.

[2] A. Young, "Increasing Returns and Economic Progress", Economic Journal, December 1928; and G.J. Stigler, "The Division of Labour is Limited by the Extent of the Market", Journal of Political Economy, June 1951.

principal economies which manifest themselves in increasing returns[1] are those of roundabout production,[2] resulting from the sub-dividing of complex processes into a succession of simpler ones some of which lend themselves to the use of machinery.

Both Allyn Young[3] and G.J. Stigler[4] have written on the division of labour in conscious attempts to champion and to develop Classical views (principally in opposition to neoclassical price theory) and their views are worth recording. Young stresses the use of roundabout production processes within firms, between firms, and in the division of

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[1] In this discussion much use is made of the expression "increasing returns" as a general term, meaning all lowerings of the average cost of producing an article as all inputs are increased in the long run. It is possible also to use division of labour in the generic sense of an all-inclusive explanation of increasing returns. However, Marshall treats external economies and the division of labour as separate concepts, associating the former, according to Youngson, with massive production and the latter with internal economies of the firm. Clearly, it is possible to explain some external economies in terms of division of labour between firms. For example, there is the provision of certain specialised services in an industry which could not be provided when the industry was of small size. On the other hand the existence of a pool of trained labour as a result of localisation of an industry in a particular area, where there are no training facilities other than those provided by individual firms, is less easy to explain by division of labour. In spite of his stress on massive production as a factor in economic growth, Marshall was responsible for greatly narrowing the scope of increasing returns. In order theoretically to maintain competition in an industry in the face of increasing returns, Marshall resorted mainly to the concept of external economies, making lower costs for the firm depend on the size of the industry not of the firm. Thus, as Sraffa indicates, ("The Law of Returns Under Competitive Conditions", Economic Journal, 1926), the part played by the division of labour within firms was completely abandoned. Moreover, J.H. Clapham ("Of Empty Economic Boxes", Economic Journal, 1922) suggests that even the improvements in Marshall's industries resulting from increased size were entirely organizational and did not include technological innovations. Clearly, in Marshall's hands increasing returns were a much more static concept than in those of Mill.

[2] Young, op.cit., p. 531.

[3] Op.cit.

[4] Op.cit.

labour between industries. Growth of market size is essential to capitalistic production as many such processes are indivisible. Young also shows how the division of labour determines market size as well as depending on market size. As division of labour grows so does income via the multiplier and investment via the accelerator, thus forming a cumulative process of capital accumulation. Stigler's article, written after Young and acknowledging Young's contribution, examines the division of labour between firms. He shows how the growth of an industry is often accompanied by vertical disintegration as specialised functions originally performed by all firms are hived off to specialist firms who can take full advantage of indivisible production processes. Thus Adam Smith's idea is developed into a fundamental principle of economic organization, and its connection with the use of capital is clearly shown.

The third aspect of Classical theory is the inducement to savings and investment caused by trade. The Classical position is well stated in the quotations from Mill and needs little elaboration. It may be noted here that these effects will be relevant for the later considerations of staple theories of growth, particularly in connection with whether trade is a mere reallocation of investment resources.

It is interesting to see the great extent to which the major arguments used in current discussions are foreshadowed by the Classical economists. There is the stress on export expansion leading to increased productivity and technical change in the export industry, on the greater opportunities for the use of capital, the changing of preferences in favour of work and away from leisure and of time preference in favour of future goods. The section concludes by outlining briefly the views of some modern writers who have written in the

Classical tradition.

II - 1vi Modern "Classical" Writings

Almost all of these have been in response to criticisms of the Classical position by such writers as Myrdal and Singer, whose writings are discussed in Section 3. Summarised here are the views of Viner,[1] Haberler,[2] and Hicks,[3] all of whom feel great advantages accrue to underdeveloped countries from trade.

Viner's Brazil lectures are entitled "International Trade and Economic Development" and one may look with interest to see what this distinguished economist has to say on the subject.[4] In fact Viner's analysis is rather general and consists of reasserting the relevance of specialisation according to comparative cost for underdeveloped countries. In particular Viner dislikes the popular identification of agriculture with poverty and goes to some length to show exceptions to this rule. He actually says little about the dynamic aspects of Classical theory.

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1 J. Viner, International Trade and Economic Development, Lectures delivered at the National University of Brazil, (Oxford, 1953).

2 Cairo Lecture, op.cit.

3 J.R. Hicks, Essays in World Economics, (Oxford, 1959) Chapter VIII, "National Economic Development in the International Setting."

4 Myint, (op.cit., p. 317) picks out Viner as the representative defender of the relevance of Classical theory to trade and underdeveloped countries. In fact both Haberler and Hicks give fuller and more relevant discussions.

Haberler's views are more interesting. After a brief defence of the relevance of comparative costs to the analysis of the real world, he goes on to discuss the effects of trade and growth. He distinguishes four ways in which trade can shift the production possibility curve outwards: a) by providing imported (capital) goods essential to development (these capital goods enable underdeveloped countries to reap the benefits of the advanced technology of the country producing the capital goods); b) as the vehicle for transmission of ideas, technical knowledge, skill, managerial talent, and entrepreneurship; c) as the vehicle for capital movements to underdeveloped countries; d) by fostering competition with domestic industries, thus improving their efficiency (although Haberler does conceed the relevance of infant industry arguments in some cases).

Hicks' essay "National Economic Development in the International Setting", lists two major dynamic gains from trade for poor countries. First, he says, the gain from trade can reflect indirect utilities. A country can export goods of low growth potential in exchange for goods of high growth potential, such as capital equipment, which yield utilities as instruments for future production. This is again because the productivity of capital goods industries (which are subject to considerable economies of scale) is likely to be much higher in advanced than in underdeveloped countries. His second point is essentially that made by Allyn Young and Mill before him, that foreign trade can yield increasing returns. Hicks is particularly in favour of underdeveloped countries exporting simple manufactures, since increasing returns are more likely to occur in these than in primary product exports, and market opportunities are better, especially if they export the manufactures to each

other.

The major point which emerges from these writings, which was not developed by the Classical writers themselves, is that of importing technology in the form of capital goods. More stress also is placed on the role of foreign direct investment, and this reflects more closely the way in which present day underdeveloped countries were opened up to trade.

Section II - 2 Staple Theories

Staple theories divide into two streams:[1] the Canadian staple theories pioneered and overwhelmingly influenced by Harold A. Innis[2] [3]

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[1] This is not to say that staple theories could not be developed for other economies similar to Canada and the early United States, such as Australia, but to my knowledge this has not been done. A.J. Youngson, in Possibilities of Economic Progress (Cambridge 1959) gives accounts of trade and growth in Denmark and Sweden but these, while interesting, add little to the staple theories in terms of knowledge of trade and growth mechanisms.

[2] Innis's writings are extensive. His best known works are The Fur Trade in Canada. An Introduction to Canadian Economic History (Toronto, 1930) and The Cod Fisheries. The History of an International Economy (Toronto, 1940). These deal with the early settlement and growth of Canada in the context of an international economy. According to W.A. Mackintosh (in "Innis on Canadian Economic Development" Journal of Political Economy, June 1953, p. 187), Innis's work for his doctoral thesis published as The History of the Canadian Pacific Railway (Toronto, 1923), had shown him the importance of export staples in new economies. The Fur Trade and the Cod Fisheries were attempts to get at these first sources of Canadian development. These writings, and Settlement and the Forest and Mining Frontier (Toronto, 1936), written with A.R.M. Lower, cover Innis's basic research. Later writings, most conveniently found in Essays in Canadian Economic History, edited by Mary Q. Innis, (Toronto, 1956), cover aspects of later developments:- the palaeotechnic coal-wheat economy, and the shift to a neotechnic economy based on hydro-electric power, and on pulp and paper and the new minerals as staples. These however are more of the nature of (often very penetrating) comments, than the results of solid research. There is also much work in other fields, such as the history of communications, which does not directly concern us. There is also a substantial body of literature devoted to interpreting and assessing Innis's ideas. This includes W.T. Easterbrook, "Innis and Economics", Canadian Journal of Economics and Political Science, August 1953; A.W. Plumptre, "The Nature of Political and Economic Development in the British Dominions", Canadian Journal of Economics and Political Science, November 1937 (this is more a summary of the staple theory than a specific work on Innis); K. Buckley, "The Role of Staple Theories in Canada's Economic Development", Journal of Economic History, December 1958; M.W. Watkins, "A Staple Theory of Economic Growth", Canadian Journal of Economics and Political Science, May 1963, which is a conscious attempt to formulate Innis's approach in terms of modern economic theory; and R.E. Caves and R.H. Holton, The Canadian Economy. Prospect and Retrospect (Cambridge, Mass., 1961) Chapter II.

[3] Other writers of course contributed to the Canadian staple theory. Innis himself acknowledged the influence of W.A. Mackintosh, particularly the latter's "Economic Factors in Canadian History" Canadian Historical Review, IV, 1923, who suggested that Canada has failed to achieve substantial development until the expansion of wheat exports at the turn of the century. G.S. Callender, an American economic historian, is sometimes cited as the founder of the staple school (e.g. his Selections from the Economic History of the United States, 1765-1860 (Boston, 1909) cited by M.W. Watkins, op.cit.

and the more recent lone attempts by D.C. North to present certain aspects of United States growth in terms of the influence of staple exports.[1] The two streams differ in certain respects and a good case can be made for presenting them sequentially, with North's approach treated as a more modern development of Innis's. This section discusses briefly the differences in the approaches, outlines each approach separately, and then tries to draw together the major elements of a staple theory. Finally, a recent test of the staple theory is discussed.

II - 2i The Two Approaches

The main difference in approach is that North's is explicitly theoretical and Innis's is not. North sets out his staple theory clearly in two articles (see note 1). His empirical work is then an

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[1] North's original presentation of his staple theory is in "Location Theory and Regional Economic Growth", Journal of Political Economy, June 1955, which is a theoretical discussion using the growth of the American Pacific North-West from 1880-1920 as an example. The thesis is elaborated, again with brief examples, in "Agriculture in Regional Economic Growth", Journal of Farm Economics, December 1959. Finally, The Economic Growth of the United States 1790-1860 (New York, 1961) presents the thesis with the fuller supporting statistical and qualitative evidence which was lacking in the earlier articles. His later work, Growth and Welfare in the American Past. A New Economic History (New Jersey, 1966), not covered here, lays less stress on staples and more stress on development over a broad front.

attempt to present the theoretical argument with full supporting evidence. Innis's approach is primarily historical.[1] He does not present an explicit staple theory, nor is his work organized around an explicit analytical framework. Thus to a certain extent it is necessary to go through his empirical work to glean his approach. However, his general position is summarised in a number of his Essays in Canadian Economic History. A particular problem in surveying Innis's work is that his writings are vast, and his interests very wide. He was less interested in the staple approach as a theory of economic growth than as an economic interpretation of history. In order to de-limit a field for this survey six key articles are chosen, all reprinted in his Essays,[2] and the Fur Trade in Canada is used to represent his empirical work. The latter choice can be justified by the wide acceptance of the view that of his three works on staples only the Cod Fisheries and the Fur Trade are truly outstanding,[3] and that the Cod Fisheries goes beyond

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[1] However, he placed much stress on the relation between economics and economic history. See "the Teaching of Economic History in Canada", in Essays, op.cit.

[2] "The Teaching of Economic History" (1929); "Transportation as a Factor in Canadian Economic History" (1931); "Unused Capacity as a Factor in Canadian Economic History" (1936); "Significant Factors in Canadian Economic Development" (1937); "An Introduction to Canadian Economic Studies" (1937); and "The Penetrative Power of the Price System" (1938).

[3] Mackintosh, op.cit., p. 189 and 193.

his earlier interests in staples to consider such problems as the rise and fall of empires.[1]

II - 2ii Innis

Innis's general position is well set out in his essay "The Teaching of Economic History in Canada". The economic theory of the "old countries" is held to be inapplicable to Canadian economic problems. Moreover, attempts to fit these theories to the economic facts of new countries are beset with dangers. The only escape is through an intensive study of Canadian economic problems. Here great stress is laid on economic history as a means of testing and improving economic theory. From a study of Canadian economic history Innis hopes will emerge a philosophy of economic history or an economic theory (he states no preference between them) applicable to Canada.

His main contention, which leads directly to the staple thesis, is that Canadian economic history, and thereby Canadian economics and development must be approached through a study of the country's foreign trade. Contact with the "old country" has been essential. Canada has never been selfsufficient and her existence has depended on relations with the outside world. Canada is seen as part of the expanding international economy, the extent of which is determined by the limits of the price system operating internationally, and the integration of which is brought about by flows of commodities.[2] Development of

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[1] Easterbrook, op.cit., p. 292.

[2] Buckley, op.cit., p. 441-2.

Canada took the form of an increasing degree of integration into the international economy. Accompanying the history of trade, however, must be a study of transportation. This has greatly influenced both the establishment of particular staples and their economic (and non-economic) effects, once established. Innis's views on transport and its related problem of unused capacity must be examined therefore before examining the process of integration into the international economy exemplified in his essay "The Penetrative Power of the Price System".

Essentially, Innis's stress on transport is part of his stress on technology which virtually all commentators on Innis have noted. Transportation of course is a key means of widening markets, and it was cheap water transportation which brought Europeans to North America and enabled the development of cod fishing, the first staple export activity, to occur; thus widening the international economy. Because of the primitive state of transport technology, water transport was of key importance inland. Settlement was discouraged by the lack of agricultural possibilities in the Maritimes and the St. Lawrence region (in contrast for example to New England), and the main economic activity possible was the export of fur (principally of the beaver). Fur was of high value relative to bulk and weight and could bear the heavy costs of primitive transport. The fur trade first developed incidentally to cod fishing as fur exports took up little space in the ships bound for Europe with fish. But after a substantial rise in demand for beaver hats in Europe, especially France, in the seventeenth Century, the fur trade was established in its own right. Thus transport technology,

combined with demand,[1] determined the establishment of the first staple exports. Transport considerations also significantly determined the effects of those stables. The fur trade involved increasing penetration to the interior as the stock of beaver became exhausted near the coast, and this required large amounts of supplies, both of provisions for the traders and of goods to exchange with the Indian hunters.[2] Thus unused capacity on the journeys back from the interior to the coast and from the coast to Europe, was created, since the fur exported was of much less weight and bulk than the supplies sent in. This induced the fur companies to try to increase the supply of beaver, which involved further extension inland, and helped solve the problem only as long as penetrating inland was <u>increasing</u>.[3] It also gave no encouragement to settlement.[4] In contrast, the lumber trade which developed in the St. Lawrence after 1821 when the fur trade migrated to the Hudson's Bay involved excess capacity on the voyage to Canada, and thus encouraged settlement and thereby development of the region.[5]

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[1] The role of technology and demand in the establishment of staples is stated most clearly in Caves and Holton, <u>op.cit.</u>, Chapter II.

[2] <u>Fur Trade</u>, <u>op.cit</u>., p. 6.

[3] Note that the effect of penetration inland having to stop, because it had reached its geographical limit, was an important factor in the eventual weakening of the North-West Company in its competition with the Hudsons Bay Company.

[4] The fur traders in fact were actively opposed to settlement because of its adverse effects on beaver supply.

[5] We are of course interested ultimately in the growth of output per head, and thus cannot regard increased settlement as "economic development" in itself. However, development of a region's resources by settlers is an essential prerequisite to eventual rises in per capita output.

Unused capacity and transport technology (as well of course as demand) were crucial in the economic effects of later staples. Wheat involved heavy capital expenditure on railways. Unused capacity was created by peak loading, as wheat could not be exported during the season when the St. Lawrence was closed to navigation. In an attempt to cover the overhead costs of railways and to use the excess capacity, railway interests and the government tried to promote increases in traffic by such methods as construction of feeder lines to railways, ocean transport (by the Canadian Pacific Railways) and, in the case of the government, encouragement to private business enterprise in the West. Also, the shift from water to land transport required a shift from short term to long term credit.[1]

The means by which development through trade took place, in other words the way in which the international economy developed from the centre to the periphery, was by the increasingly effective operation of the price system coupled with technological changes (e.g. railways, new strains of wheat) which facilitated the development of new staples. This view is put forward in "The Penetrative Power of the Price System", although the exposition is closely tied to Innis's broader interests, which have been already mentioned. The precise meaning which Innis attaches to 'price system' is not entirely clear.[2] Evidently it is

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[1] The fur trade's capital requirements were mainly in the form of circulating capital, especially provisions, whereas the railways and canals required fixed capital. The differences in raising these sorts of finance account for Innis's distinction, which he extends to a distinction between commercialism and capitalism.

[2] For a discussion of the "Penetrative Power of the Price System" which is more critical of Innis's approach see E.E. Lampard "The Price System and Economic Change. A Commentary on Theory and History", Journal of Economic History, No. 4, 1960. Lampard suggests that Innis even includes technological change under his definition of the price system.

closely connected with free trade and private enterprise and even at times identified with the use of money.[1] However the general meaning clearly stresses responsiveness to economic incentives allowed to operate as freely as possible. The essay discusses only in general fashion the operation of economic incentives as promoters of development. Demand for goods in the "old world" e.g. for wheat as workers' living standards rose at the end of the nineteenth century in Britain, encourages export production in the new world. Technological change is also an important factor in development. Transport developments have already been dealt with. New sources of power helped bring about the change from the palaeo-technic society based on coal and iron to the neo-technic society producing pulp and paper and minerals. However, Innis appears to think that it is the price system rather than technological change _per se_ which lies at the back of development:

> "The effectiveness of the price system has been shown in the decline of feudalism, the decline of mercantalism, the rise of palaeo-technic capitalism, and the shift to neo-technic capitalism. It has stimulated the growth of inventions and the trend in the movement of goods from light and valuable raw materials to heavy and cheap raw materials, to light and valuable finished products. It has hastened the rise of new sources of power and of new industries and accelerated the decline of obsolete regions".[2]

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[1] To this identification one may take exception. The early development of the fur trade involved _barter_ with Indians who were highly responsive to economic incentives, as witnessed, for example, in their shift from English to French sources of supply when they received more desirable manufactured goods (i.e. they were paid a higher price in real terms for their furs.) This was the operation of a price system, and did not involve the use of money.

[2] _Essays_, _op.cit._, p. 271.

Thus much technological change is induced not autonomous, and to this extent economic development is an economic not a technological matter alone.[1] However, Innis does not give a detailed account of how price incentives work. We therefore turn finally to his empirical work, of which the Fur Trade is used as an example to see what further information is available on the price mechanisms. It will be shown that even here Innis provides general guidance only. An explicit staple theory of growth is not developed. Such a theory is to be found in North.

In "The Teaching of Economic History in Canada" Innis suggests that the study of economic history as a source of relevant economic theory involves working out the economic history of each industry in turn. Of such studies The Fur Trade in Canada is a prime example. It is a detailed account of the trade from its beginnings in the sixteenth century to the twentieth century. Apart from the introductory chapter which describes the economic characteristics of the beaver, the method is of historical description interspersed with comments on the economic significance of events and aspects of the trade. Two considerations are of prime importance: the conditions which caused the trade to develop and the economic effects of its development. Innis, as was already suggested, is also interested in its wider political and social effects, of which the most important was the emergence of Canada as a political and economic entity after the American Revolution. The role of transport has already been discussed. The fur traders borrowed the technology of the Indians in the form of the canoe, which was light

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1 See Easterbrook, op.cit., for a discussion of the technology - pricing dichotomy.

enough to be carried over rapids. The trade was facilitated by the ease with which European goods (for example guns, iron pots, and cloth), fitted into the economic and cultural life of the Indians who hunted beaver[1] (and who wore beaver fur coats until the coarse guard hair had dropped out leaving only the fur, in which condition it was most suitable for export). These factors helped the establishment of the trade, which developed rapidly after the large rise in demand for beaver for fur hats in the late seventeenth century. Innis is much concerned with the penetration of the trade into the interior. This gave rise to problems of overhead costs, particularly in the form of the provision of circulating capital,[2] and eventually led to the migration of the trade to the Hudson's Bay where transport inland was by means of the York boat. The effects of the fur trade differed from those of other staples, such as lumber. This difference in the effects of different staples is a crucial feature of Innis's approach. The effects he describes work principally through the input requirements, in the broadest sense, of the fur trade. The demands of the trade for food supplies led to some limited agricultural development in the St. Lawrence region and later, with the North-West Company and after the Amalgamation, at various points on the trading routes. Also there was some demand for equipment, such as canoes. Demand for manufactured products was met from Britain. However, these effects were outweighed by the adverse effects on settle-

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[1] <u>The Fur Trade</u>, <u>op.cit.</u>, pp. 18-19. For a discussion of the introduction of Western goods into primitive cultures see Elizabeth E. Hoyt, "Want Development in Underdeveloped Areas", <u>Journal of Political Economy</u>, June 1951.

[2] This was less a question of total capital requirements than of the fact that, owing to slowness of transport, turnover was slow.

ment of fur's transport input so that the fur trade in fact retarded economic growth.[1] Some favourable effects may be noted, however. First, capital from the fur trade found its way into other lines of economic activity[2] and, second, personnel trained in the fur trade were able to fulfil entrepreneurial functions in, for example, the Canadian Pacific Railways and the Bank of Montreal as well as in government.

Further interpretation of Innis's economics is possible, but this is best left until Douglas North's contributions to the staple theory have been outlined, after which staple theories as a whole will be reviewed.

II - 2iii North

North's starting point is very similar to that of Innis. He is dissatisfied with existing views on regional economic growth,[3] which present an analysis of development from self-sufficiency to a market economy, and assume that industrialisation is a necessary condition for growth. These, says North, bear little resemblance to the actual devel-

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1 The Fur Trade, op.cit., p. 115.

2 Innis, Essays, op.cit., p. 13.

3 For purposes of criticism he presents as an example of these theories E.M. Hoover and J. Fisher "Research in Regional Economic Growth", in Universities National Bureau Committee for Economic Research, Problems in the Study of Economic Growth (New York, 1949) Chapter V.

opment of regions in the United States.[1] Settlement in American regions was shaped typically by a search for goods to export, and such regions never passed through a stage of self-sufficiency. North suggests that Harold Innis's insights into Canadian economic growth form a more useful first step in reshaping views on regional growth. North's own views are set out in two articles, cited above, "Location Theory and Regional Economic Growth", and "Agriculture in Regional Economic Growth", and in his book The Economic Growth of the United States, 1790-1860, (also cited above). These three works represent a gradual process of development of ideas. This process is not of much interest for present purposes and this subsection gives a synthesised account of North's theory, indicating his process of development only when later views contradict earlier views.

North's thesis is that specialisation and division of labour have been the most important factors in the initial expansion of regions, that this specialisation and division of labour has been induced by trade, and that involvement in the developing international economy of the last two centuries, or in the case of some American regions, in the U.S. economy has been the way in which regions and nations have achieved economic growth.[2] Apart from his rather Classical stress on division of labour, which is examined below, this bears a close resemblance to Innis's position. North, however, wishes to use the term "exportable commodities" instead of "staples". The former term can include secondary and tertiary as well as primary export goods, and is defined to

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1 "Location Theory and Regional Economic Growth", op.cit., p. 245.

2 "Agriculture in Regional Economic Growth", op.cit., p. 994.

include the whole export base. In a young region typically dependent on extractive industries North's term becomes synonomous with Innis's "staple".[1]

As before, two things are important: the establishment of the export good, and its effects. North discusses the establishment of an export in locational terms, laying stress on transport costs.[2] He notes that although demand for the export was an exogeneous variable,[3] processing costs and transport costs were not, and that both technological research and political efforts were made to reduce these. Moreover, once established, an export industry developed external economies in the form of storage facilities, trained labour force and so on.[4] He suggests also that a key condition for success in economic growth was the establishment of more than one export. This appears to be because of the more beneficial indirect effects of several exports together, as well as the fact that several exports, especially if the region is a large producer relative to world (or in some cases national) demand, have better overall sales prospects. Additional exports are more likely to be established if the region's resource base does not give a very large comparative cost advantage to any one good.

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[1] "Location Theory and Regional Economic Growth", op.cit., p. 248.

[2] This, of course, is a comparative cost approach modified to take account of mobility of factors.

[3] Although this may have been true historically, it is not necessarily the case. For example, a new region, of which Florida is a case in point, which wished to develop tourism as a (tertiary) export good, presumably could influence demand outside the region by advertising.

[4] This is rather "Marshallian". These are economies internal to the industry although external to firms within the industry. Of course, they might also promote other domestic or export activity.

The effects of export growth divide into a direct effect in the form of income received by the factors of production in the export industry, and indirect effects. It is the indirect effects, operating through the disposition of the income received by the export sector, which are crucial. This market expansion, which is a function of the size of the export sector,[1] gives opportunities for investment in industries serving and served by the export sector. These are, in North's terminology, materials - orientated industries, (which process the export good and locate at the latter's source because of transfer advantages, e.g. weight-losing by processing), service industries to the export industry (e.g. the manufacture of machinery for the industry), "residentiary" industry, (which (by definition) produces for local consumption and in this model depends primarily on sales to consumers working in the export industry), and finally foot-loose industries (which are industries for which no region has any particular locational advantage, but which can be developed with profits from exports which the recipients do not wish to plough back).[2]

The increased market size, however, offers not only inducements to invest in such industries, but also opportunities for the sort of specialisation and division of labour discussed by G.J. Stigler "The Division of Labour is Limited by the Extent of the Market",[3] which North cites,

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1 Economic Growth of the United States, op.cit., p. 10.

2 "Location Theory and Regional Economic Growth", op.cit., p. 253.

3 Op.cit.

and which was discussed in the section on Classical theories. North, like Stigler, thinks this process is of great importance in growth. The growth of exports and related industries shapes the nature of the labour force and may improve its skills. It also provides social overhead capital, credit facilities, etc., which are external economies to new industries, which themselves may eventually export. North notes that economic growth does not require exports to be industrial products. Primary products can yield growth effects and even a region with a large amount of secondary and tertiary activity and a high income level may be dependent on primary product exports.[1] Finally, demands of the export industries often may include demand for urban services. Urbanization, North thinks, is in itself an important promoter of growth since people in cities have a demand for a wider range of commodities than rural dwellers.

Different exports, however, may have very different effects.[2] North's analysis leans heavily on a pioneering article by Robert E. Baldwin, "Patterns of Development in Newly Settled Regions",[3] which also clarifies his (North's) previous work on the effects of exports.

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[1] Note that a high proportion of the work force in tertiary activities is by no means a safe indicator of previous economic growth. Many poor countries have a large proportion of workers in tertiary industries. See P.T. Bauer and B.S. Yamey, <u>The Economics of Underdeveloped Countries</u>, (Cambridge 1957), Chapter III.

[2] This marks a shift of views between North's first and second papers. In the first he does not recognize that a region may have a substantial rise in export income yet achieve little growth.

[3] <u>Manchester School of Economic and Social Studies</u>, May 1956.

Baldwin organizes the effects of export growth around the technological nature of the good's production function, laying stress on input-output variations among production functions.[1 2] Baldwin presents a brief account of different factor proportions between different commodity production functions. He then proceeds to present his main argument in the form of an analysis of the different effects of different exports in two regions, say South and West. Both South and West are equi-distant from an old region from which they can draw capital and labour within a constant state of technology. Neither new region is large enough in its early stages of development to alter factor or product prices in the old region. Labour in the old region consists of a number of imperfectly competing groups. The difference between the two new regions is that South has land and climate suitable for plantation crop and West for a family farm crop. Both new regions have an abundant supply of mineral resources such as coal and iron ore, but these intiially are at a prohibitive distant from the export ports. The family farm crop is not subject to large economies of scale in production based on extensive use of cheap unskilled labour. Moreover, the elasticity of substitution between capital and labour is relatively large. Also less technological and managerial skill is necessary to manage the optimum size of farm. In contrast, the plantation crop involves labour intensive production for a wide range of factor price ratios, has a low substitutability of capital for labour after a point, and is subject to increasing returns to scale in both cultivation and processing. Thus large amounts

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[1] Op.cit., p. 161.

[2] Baldwin's approach is also discussed in Subsection 3iii.

of capital and labour are necessary for the optimum size. It also needs much technical and managerial skill to operate a plantation efficiently. These characteristics have a crucial significance for the effects of the export goods. South imports large quantities of cheap labour. Little labour skill is needed, so little develops, and this inhibits the subsequent development of any manufacturing industry even if there is demand for the products of such an industry. Workers find it difficult to set up on their own because of the large optimum size of plantation. The few managers and capitalists consume imported luxuries, and the workers consume only simple goods. Thus there is little demand for local residentiary industry. Profits tend to be repatriated or reinvested in the export sector or in luxury construction only. West, on the other hand, imports more skilled immigrants who also own capital. The result- income distribution is more even, and demand for local consumer goods is stronger. Moreover workers in the family farm sector are more suitable as domestic entrepreneurs or skilled workers than are the workers in South.

Baldwin's analysis tries to show the different effects of different production technologies under restrictive assumptions. The main effects are in two forms: the nature of the labour imported and the demands for final consumer goods. The first effect however seems to obscure rather than clarifies the issue. By having what are virtually non-competing groups in the old country's labour force (which may be imported by the new countries), Baldwin allows West to import people who are themselves already "developed". In view of the importance of investment in human capital, it is hardly surprising that West develops more rapidly. It is half way there already, as it were, by virtue of the quality of its

labour force. More important, is that West's production activity means more labour training, more domestic savings (equal income distribution means that people have savings who are more willing to invest domestically), and more demand for consumer goods which can be produced domestically.

North feels that Baldwin's two regions can be made to approximate, essentially, to the American South and West before the Civil War. Although cotton exports from the South were the largest single item and the fastest growing item in U.S. exports from 1815-1860, their growth, which North says was the proximate cause of U.S. growth from 1815-1860, benefitted the growth of the West and North-East, not the South. The South's income flowed out in imports of consumer goods from the West and services from the North-East.[1] Also, the economic structure of the South gave little incentive to the holders of economic power to press for investment in education, which was a crucial advantage in the other two regions.[2] Interesting also is the contention that the North-East's ability to provide services and to process cotton into textiles had had its foundations (in the form of social overhead capital, skilled labour force, etc.) in the effects of the carrying trade from and to the British Colonies.[3] Finally, the Baldwin-North production function approach can

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[1] See Economic Growth of the United States, op.cit., p. 67.

[2] Ibid., p. 174.

[3] The expansion of the carrying trade took the form of price as well as volume increases. The terms of trade improved, and there was a rise in ocean freight rates which raised the return to shipping.

be integrated, as North acknowledges,[1] into A.O. Hirschman's famous analysis of linkages.[2] The production function of the export good yields backward linkages to industries supplying it with inputs, forward linkages to industries supplied by it, and final demand linkages.[3] Labour training effects and the increase in the supply of entrepreneurs who leave the export industry having been trained there, are technological externalities, in contrast to the pecuniary externalities of Hirschman's linkages.[4]

Two more features remain to be discussed. First, North describes conditions for the continued growth of regions in terms of the emergence of new exports. Here his position is a little odd. He suggests that a region will not normally achieve growth if it has only a single export[5] because this will mean that specialisation and division of labour are limited outside that industry. This implies that two industries each yielding $\$\frac{1}{2}x$ of income each year yield more technological and pecuniary externalities than one of $\$x$ per year. There is no reason to assume this. Indeed, if one industry yields more linkages than the other,

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1 Economic Growth of the United States, op.cit., p. 170.

2 See The Strategy of Economic Development, (New Haven, 1958).

3 This term is from M.H. Watkins, op.cit., p. 145.

4 See T. Scitovsky, "Two Concepts of External Economies", Journal of Political Economy, April 1954, reprinted in his Papers on Welfare and Growth (London 1964), for an account of the distinction between pecuniary and technological externalities.

5 "Agriculture in Regional Economic Growth", op.cit., p. 945.

there is a case, in terms of externalities, for concentrating all export resources on it. The real reason for the need of additional export industries is that demand is limited, and new industries are necessary in response to (or in anticipation of) changes in foreign demand which may bring about the decline of any particular export.

Second, all of the above discussion, as in North's work, has been in terms of the growth of national income - of the "extensive" growth of the economy. Yet economic growth, in any meaningful sense, must mean increased income per head. This dilemma for North is easily resolved.[1] The increased efficiency of productive factors, which results in rising per capita income, is the result of technological innovations, investment in research, training, and education, and improved organization of economic activity, of which the latter is the chief proximate cause of growth. Each of these itself resulted from export growth, which widened the domestic market, giving scope for specialisation and division of labour of the sort described by Stigler,[2] induced investment in human

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[1] See Economic Growth of the United States, op.cit., pp. 7-11.

[2] Op.cit.

beings, and rewarded adaptation of European technology to American needs.[1 2]

North is aware of the limitations of the staple approach.[3] This is shown clearly in his <u>Economic Growth of the United States</u>. In the 1820's and 1830's cotton exports from the South were expanding rapidly. These exports were being processed by the North-East textile industry. At this time the linkages associated with this textile industry were important since the North-East was only a marginal producer of manufactures. But, says North,

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[1] The dilemma is less easily resolved in Innis. For example, the lumber trade encouraged settlement via excess capacity on the return trip to Canada. This promoted the <u>extensive</u> growth of the Canadian economy. Later however, excess capacity on the incoming trip would mean low transfer costs for imports, which might discourage local production of import-competiting goods, and push the economy towards a "staple trap".

[2] In fact, recently J.H. Dales, J.C. McManus, and M.H. Watkins have contended that Canadian staple theories were <u>only</u> concerned with extensive growth. While this may be true, it is still interesting to ask whether the extensive growth caused by staple export expansion also brought about rises in output per head (intensive growth). Certainly Watkins' own presentation of the staple theory (<u>op.cit.</u>) would explain intensive as well as extensive growth. See their "Primary Products and Economic Growth: A Comment", <u>Journal of Political Economy</u>, December 1967. The controversy of which their "comment" forms part is discussed further in Section 2v.

[3] For a discussion of Innis's lack of awareness of these limitations, see K. Buckley, <u>op.cit.</u>

> "By the middle of the 1840's however, when the surge of the expansion got underway, it was not one or two industries which were leading sectors, but a much more generalised ability to produce manufacturers."[1]

Again, he says,

> "The critical influence in American manufacturing development was not so much one or two strategic industries, but the general improvement of factor endowments for manufacturing".[2]

Thus, by 1840, the North-East of the United States had become a mature region, and a staple theory was no longer adequate to describe its growth.

II - 2iv <u>The Staple Approach as a Theory of Growth</u>

The approaches of the two main staple theorists have now been outlined. Here an attempt is made to set out the essence of a staple theory of growth and to clarify a number of unresolved issues. It is not intended, however, to survey the surveys on staple theory. These are only discussed where they give new insights.

Most recent commentators seem to agree that the staple approach is essentially a theory of capital formation and industrial location.[3] In Innis's hands it was also an economic interpretation of history. Further, there is a good case for elevating the role of technological externalities to an important position in staple theories.

It has often been remarked that the staple theory is a regional approach. Innis treated Canada as a region in a developing international

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[1] <u>Economic Growth of the United States</u>, <u>op.cit</u>., p. 175.

[2] <u>Ibid</u>., p. 174.

[3] For example Caves and Holton, <u>op.cit</u>., p. 31; Watkins, <u>op.cit</u>., p. 145.

economy. North was interested in regional growth per se, even within the U.S. national economy. Locational considerations, with a given technology, determine whether a particular export may be developed in a particular region. In this sense all international trade theory is a theory of industrial location, dealing with national regions[1] although usually with different assumptions about factor mobility and with less stress on transfer costs. However, the staple theorists' regional approach has been criticised severely. C.M. Tiebout suggests that if a broader definition of a region is taken then the crucial role of exports breaks down.[2] But this applies only to a region within a national economy which is not itself dependent on exports for growth.[3] This is in contrast to North's case of the United States before the Civil War which depended, ultimately, to 1840 at least, on the carrying trade and cotton textiles exports for its growth. The main point is that North is interested in the growth of a region or country which is able to sell its products to another region or country which is already developed. In one sense, however, it is undesirable to stress the region rather than the national economy. If a particular region is exporting to somewhere

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1 This theme runs through Bertil Ohlin's famous treatise, Interregional and International Trade (Cambridge, Mass., 1933).

2 "Exports and Regional Economic Growth", Journal of Political Economy, April 1956. See also Reply by North and Rejoinder by Tiebout in the same issue. The controversy is discussed in M.D. Thomas, "The Export Base and Development Stages Theories of Regional Economic Growth. An Appraisal", Land Economics, November 1964.

3 Tiebout also suggests that it applied to Western Europe as a whole, Reply, p. 169.

outside the national economy, and no other region in the country is experiencing economic growth directly through exports to abroad, it will be desirable (if the growth of the national economy is the main interest) not to confine attention artificially to the exporting regions. Instead its effects on growth in the other areas should be examined.

Capital formation is the result of the widening of the market due to increments in income from export expansion. Growth of exports offers investment opportunities through forward, backward, and final demand linkages.[1] These effects, and others, can be organized around the export good's production function. However, there is one fundamental theoretical objection to this approach which, although it may be overcome for North America has relevance for underdeveloped countries and implicitly underlies some criticisms of trade as a promoter of growth. The objection is that unless domestic savings are themselves a function of existing investment opportunities, or unless outside capital can be relied on completely to supply funds for all linked investments as well as for the export growth itself, then the investment induced by export growth is but a re-allocation of existing investment resources, not a net addition to capital formation. The answer to this dilemma is an empirical question. In the next section evidence for underdeveloped countries will be presented. Meanwhile, for North America, capital inflows and reinvested profits (the latter of course

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1 Watkins, op.cit., p. 145, has described this as a disaggregated multiplier-accelerator mechanism. This involves a re-definition of "accelerator" to include investment induced directly by other investment. See Hirschman, op.cit., pp. 41-2.

<u>are</u> savings) appear to have been sufficient for commentators not to have spoken of this problem. Of course, even if investment induced by exports is only a re-allocation of resource, it may nevertheless promote growth. It may permit more efficient organization of production of the sort stressed by North,[1] and this in turn may itself also require technological change embodied in new capital goods. Also, export growth can be a major source of technological externalities as well as the pecuniary ones outlined above, which work through the price mechanism.

Richard E. Caves has given an interesting and well-presented interpretation of staple theories which does not lay heavy stress on capital formation.[2] Caves suggests that two important models of trade and growth - the staple theory, and the "vent for surplus" theory, which is discussed in Subsection 3iii - bear a close structural similarity. Both models depict the effects of trade and growth as involving the exploitation of resources lacking, at that time and place, any alternative uses of significant economic value.[3] The difference is that the staple theory involves surplus natural resources and the other theory involves surplus labour. In this subsection only the staple version is

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[1] It is interesting to note that this appears to be genuinely "dis-embodied" technological change which is not just a catchall for sources of growth which cannot be identified. See R.M. Solow, "Technological Change and the Aggregate Production Function", <u>Review of Economics and Statistics</u>, August 1957.

[2] "Vent for Surplus Models of Trade and Growth", in R.E. Baldwin (and thirteen other authors), <u>Trade, Growth, and the Balance of Payments. Essays in Honour of Gottfried Haberler</u>, (Amsterdam, 1965).

[3] <u>Ibid.</u>, p. 96

dealt with. Caves' model is presented in rigorous though non-mathematical form,[1] and it is not appropriate here to present it in full. However, the main features are as follows: there are two regions I and II. The first is a developed region, in full neo-classical static equilibrium, with a fixed labour force and (perfectly malleable) capital stock. II is initially uninhabited. Rich deposits of a natural resource are then found in II, and capital and labour migrate from I to II to exploit these. The world supply of the resource is increased, its price falls, and again a full no-growth equilibrium is reached. Factors released from the production of (Ricardian-extensive) marginal units of the natural resource in I produce consumer goods which are bought with the rise in world income due to the lower real cost of producing the newly discovered natural resource in II. Manufacturing industries develop in II if the natural resources found are large enough to induce a large enough factor inflow to provide a sufficiently large domestic market (manufacturing is assumed to be subject to increasing returns to scale at low outputs and therefore a certain minimum size is required before industry in II can compete with industry in I). Services, which face infinite transportation costs, develop from the outset. Thus the staple theory of growth is seen as a response to a disequilibrium situation (the discovery of a new natural resource), in an underlying situation of no-growth. It could also be superimposed on a model of long run neo-classical growth in factor supply,[2] which would itself raise the demand for staples and intensify attempts at their

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[1] In view of the large number of variables he choses not to use mathematical analysis, the results of which he feels would be ponderous.

[2] Op.cit., p. 102-3.

discovery. Caves does conceed, however, that the pecuniary and technological externalities induced by staple export growth are important in practical applications of the theory,[1] and could alter the no-growth or autonomous neo-classical growth-only long run equilibrium conditions, but these do not appear to him as the theory's essential nature.

It is now appropriate explicitly to discuss externalities, to which reference frequently has been made here. The linkage effects of export goods are pecuniary externalities. That is to say they operate through price incentives, and represent the normal functioning of a market mechanism. However, as Hirschman[2] has shown, in a developing country they may operate discontinuously and thus deserve more than dismissive treatment. Their role is to induce capital formation. They can occur in industries directly linked to exports, or form linked industries themselves, e.g. an export may require investment in a transport system (backward linkage) which in turn lowers the cost of the transport input to another industry and induces investment in that industry (forward linkage). Technological external economies work through the export industry's purchases of primary factor, and thus also can be classified by use of the production function. Even if export growth only reallocates investment resources from other activities, it may require labour skills which can be developed by the work force over time, thus augmenting the effective supply (quantity adjusted by quality) of the labour input[3] and

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[1] Ibid., pp. 110-115.

[2] Op.cit., pp. 70-2.

[3] See E.F. Denison, Why Growth Rates Differ. Post-War Experience in Nine Western Countries. (Washington, D.C., 1967), pp. 7-9.

raising per capita output. Simiarly the export industry may provide a training ground for entrepreneurs and managers. Such externalities both strengthen the economy's ability to respond to investment opportunities produced by export growth[1] and increase its general ability to grow.

The applicability of the staple theory to poor countries was not discussed by Innis. He was interested primarily in new countries, and made no comment on his theory's general applicability. North suggested that his own theory is applicable to any economy which grew up within the framework of capitalistic institutions and was free from pipulation pressure.[2] In its purest form the staple theory would envisage an empty land, with export growth brought about initially by inflows of capital and labour. However, there seems no reason why the country could not be populated before export growth (indeed the U.S. economy in 1790 fits this description,)[3] providing the population is responsive to economic incentives and had only remained in subsistence activities or had been purely local producers because of previous lack of export opportunities.

Staple theories have not been the only explanation of North American (and other) growth suggested. The stages theories criticised by North have been mentioned already. There is also the well known take-off hypothesis of W.W. Rostow.[4] Briefly, Rostow describes a process of growth involving necessary pre-conditions for rapid expansion

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[1] See Watkins, op.cit., pp. 146-7.

[2] "Location Theory and Regional Economic Growth", op.cit., pp. 243-4.

[3] See North, Economic Growth of the United States, op.cit., Chapter II.

[4] See The Stages of Economic Growth (Cambridge, 1961).

which culminate in a take-off, which for Canada, for example, he dates as 1896-1914.[1] The take-off involves one or more leading sectors which may be export industries. To this extent it is apparently similar to the staple approach. Indeed, his distinction between primary growth sectors, suplementary growth sectors, and derived growth sectors,[2] accords well with the linkage effects already described. However, his stress on pre-conditions (although he says that in the case of Canada and other countries "born free" e.g. New Zealand and Australia, the only important pre-condition was the provision of social overhead capital) is absent, except for the stress on technology, from Innis and North. Moreover he denies that agriculture (and agricultural exports) can be a leading sector. This goes strongly against the staple position,[3] although he concedes that Canadian receipts from grain exports were an important source of ploughed back profits for the take-off.[4] Nevertheless, says Rostow, it was Canadian manufacturing which was the leading sector. The relative usefulness of the staple and Rostovian hypotheses in explaining Canadian growth have been examined by G.W. Bertram.[5] Bertram finds in favour of the staple approach. He disputes the timing

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[1] Ibid., p. 43.

[2] Ibid., p. 52.

[3] See North, "Agriculture in Regional Economic Growth", op.cit.

[4] The Stages of Economic Growth, op.cit., p. 48.

[5] "Economic Growth in Canadian Industry, 1870-1915: The Staple Model and the Take-off Hypothesis," Canadian Journal of Economics and Political Science, May 1963.

of the take-off since much manufacturing development had occurred before 1896, and says that a lot of this development is to be associated with staples, such as lumber. Moreover, if any sector was a leading sector in the 1896-1914 period, it was western wheat. Bertram adds,[1] that not only is the staple model still a useful approach to the Canadian economy, but that:

> "allowing for differences in production functions, (it) may also be a useful analytical tool in determining economic policy in certain underdeveloped countries where the export sector may continue to be regarded through colonial eyes."

Finally, can the staple theory be reconciled with Classical theories ? The answer to this question is surely, yes. Classical economists emphasise growth of market size which leads to increased specialisation and division of labour and improved technology. These are found in the staple theory, together with a stress on the role of investment induced by growing market size, and an analysis of the mechanism by which such investment is promoted. The Classical emphasis on the import side as a source of raising expectations is lacking in staple theories, because the population the latter considers was already economically motivated. This emphasis therefore complements the staple approach.

II - 2v A Test of the Staple Theory

Recently Chambers and Gordon have tried to test the staple theory by estimating the growth in Canadian per capita output resulting from

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[1] *Ibid.*, p. 184.

the prairie wheat boom of 1901-11, long thought to be a classic case of the operation of the theory.[1] Essentially their model envisages an off-take of labour from domestic manufacturing industry ("gadgets") into prairie agriculture ("wheat") at a constant real wage.[2] Assuming (initially) that no capital is used, or (later) that returns to capital (and to improvements in technology) are included in land rent, Chambers and Gordon calculate the rent paid on prairie agricultural land, imputing rent at the same rate to non-rented land. The increase in total rental income is the contribution of the wheat boom to economic growth. On this basis the growth in prairie agriculture (mainly wheat) would have contributed at most less than 9% of the actual rise in Canadian per capita output during the period 1901-1911.[3] If not wheat, then what did cause the rise in incomes ? The authors fall back on technological change of a residual type as the answer. No hint is given as to whether the growth of the wheat economy could have contributed in any way to this residual.

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[1] E.F. Chambers and D.F. Gordon, "Primary Products and Economic Growth - An Empirical Measurement", Journal of Political Economy, August 1966.

[2] The real wage is constant since it is assumed, on the grounds of qualitative empirical evidence, that the supply of all factors to domestic manufacturing was highly elastic, hence no rise in marginal labour productivity took place when labour moved into wheat. See ibid., pp. 318-319 and 324-325. This is a novel variation on models of dualistic development (see Subsection 3v), with manufacturing as the reservoir of unlimited supplies of labour to agriculture !

[3] Ibid., p. 320.

The Chambers and Gordon paper has been fiercely attacked by Dales, McManus and Watkins.[1] Dales and associates take exception to the idea that estimating rises in per capita output resulting from staple exports is a valid test of the staple theory. Staple theorists, Canadian ones at least, it seems were interested only in the extensive growth of the economy (i.e. rises in GNP, population, etc.) not in rises in per capita output (intensive growth). Nevertheless, staple theories as presented in this section appear to possess considerable explanatory powers of rises in per capita output, and it is of interest to see whether staple exports did in fact bring about this intensive growth. More important, the critics make a number of telling points about the methodology of the paper. Perhaps the most important is that no attempt is made to estimate wheat's effects on other sectors. Although Chambers and Gordon say in their 'Rejoinder' they accept this is important, they nevertheless exclude it from their analysis. A valid but less important point is that Chambers and Gordon neglect the gain from tariff revenues if more 'gadgets' must be imported as labour is transferred to wheat. The attack on Chambers and Gordon's counterfactual proposition - a Canada without wheat - is more of a debating point, and is well answered by the 'Rejoinder'.[2]

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[1] "Primary Products and Economic Growth: A Comment", op.cit. See also "Rejoinder" by Chambers and Gordon in the same issue (Journal of Political Economy, December 1967.)

[2] Dales et al. attack the proposition that the prairies are covered by inpenetrable rock, without seeing that this is merely a fanciful way of postulating a situation where wheat exports did not occur. See "Comment", op.cit., p. 879, and "Rejoinder", op.cit., p. 881.

Section II - 3 Trade and Growth in Poor Countries

This section surveys the literature on the operation of trade in underdeveloped countries. It is particularly concerned with finding explanations of why mechanisms which appear to promote growth in some circumstances may be less successful in others. It deals first with Marxist theories, which give an extreme explanation of the trade and growth process. Second, it deals with the so-called Singer-Myrdal-Prebisch hypothesis that trade has impoverished underdeveloped countries, and, third, with less extreme explanations of limited economic development following trade expansion. Fourth, some miscellaneous work on trade and growth is summarized.

Much of the literature is concerned with the relationship of the export sector to the domestic economy. Therefore certain aspects of theories of "dualistic" development are presented in the hope that they shed light on trade and growth.

Finally, some macro export-growth models are set out, followed by a discussion of trade policy for development.

II - 3i Marxist Theories

Although the interest taken by Western economists in trade and underdeveloped countries is predominantly a post-war phenomenon, Marxist writers have long been concerned with the problem. This interest has found expression in their theory of imperialism, put forward by Marx but most commonly associated with Lenin. Imperialism, for Marxists, is an integral aspect of capitalistic development. The whole process

of capitalistic development cannot be surveyed here. Instead, the main features of the imperialism theory are presented, using Schumpeter's account of Marxian economics in Ten Great Economists[1] and Lenin's Imperialism.[2]

Imperialism is associated with the highest stage of capitalism - monopoly capitalism. In this stage accumulation of capital has proceeded to such an extent that the rate of profit has fallen, and capitalists are forced to look abroad if they are to find new labour to exploit.[3] This export of capital is made possible by the fact that backward countries have already been drawn into international capitalist intercourse.[4] Also concerned is a demand for new and cheap sources of raw materials,[5] and dumping grounds for manufactured goods in order to support monopoly prices at home.[6]

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[1] (New York, 1951). Page numbers refer to Galaxy edition, 1965.

[2] V.I. Lenin, Imperialism. The Highest Stage of Capitalism. A Popular Outline, 1917, reprinted in The Essentials of Lenin in Two Volumes, Volume 1 (London, 1947).

[3] Schumpeter, op.cit., p. 62.

[4] Lenin, op.cit., p. 688.

[5] Lenin notes that while Britain enjoyed her monopoly position as "workshop of the world", she was able to acquire raw materials by trade, in exchange for manufactures. This monopoly was undermined in the last quarter of the nineteenth century. Ibid., p. 688.

[6] Ibid., p. 729.

The effects of this capital export on the recipient countries is not outlined in detail. Lenin suggests it will greatly promote capitalist development,[1] and implies that the effects of such development on the masses of the populations will be similar to that in advanced countries. Advanced countries reap additional benefits (i.e. in addition to exploitation) from the raw material exports from backward countries which much of their investment finances. Of course, the ultimate effects of imperialism are to hasten the collapse of capitalism, as capitalists attempt to protect their overseas investment by colonisation and by wars with other imperialists.

Thus external relations of rich with poor countries are fitted easily into the Marxist framework. This framework *per se* is not important here, but what is interesting is that the Marxists have been able to formulate a model in which poor countries import capital and export raw materials, but do not themselves benefit. It will be shown that this approach, when stripped of its Marxist trappings, is very much that adopted by critics of the Classical theory of trade and growth.

Finally there is a modern, quasi-Marxist view, presented by Paul A. Baran.[2] Baran observes that while capitalism in the latter eighteenth and the whole of the nineteenth century provided for a momentous expansion of productivity and welfare, albeit primarily for the privileged classes, the benefits of this expansion were negligible for the underdeveloped world. There, productivity was low and living standards were

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[1] *Ibid.*, p. 690.

[2] "On the Political Economy of Backwardness", *Manchester School of Economic and Social Studies*, January 1952.

pushed down by population growth. Some capital did flow into poor countries, but, with a few exceptions their populations benefited little. Capitalist expansion did have certain effects. It reorientated the economies of backward countries away from subsistence production towards production for world markets,[1] and generally substituted market contracts for paternalistic feudal relationships.

However, the change to market rationality was not complete. Indeed, by removing the paternalistic aspects of feudalism it left the ruling classes in a freer position to exploit the masses. At the same time, imported capital and technology and other contacts with the West showed people in underdeveloped countries the fruits of western material progress.

"They aroused aspirations, envies, and hopes."[2]

Thus were sown the seeds of revolution. Revolution could be averted if the middle-class accepted its responsibilities and introduced capitalistic institutions on a large scale (under which, he implies, the masses would achieve more material advancement than under their feudal overlords). But the middle-classes are too closely allied to the outlook and mores of the ruling classes to provide the necessary leadership. Nor are governments able to take the measures necessary to promote development. Investment is low because of the structure of existing demand, which favours luxury imports on the one hand and production of primitive items of food and clothing on the other. Savings

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[1] Baran does not state that it was Western influence that also raised the rate of population growth, but this is implied.

[2] Ibid., p. 68.

are low because, with a very unequal distribution of income, high income receivers engage in conspicuous consumption, while the export industries are largely the domain of foreigners. But removing these and other obstacles, e.g. by taking excess saving and using the proceeds for investment, could involve the government taking action against the interests of the very classes which it represents.

II - 3ii Modern Criticisms of Classical Trade and Growth Theories

The first serious non-Marxist attempts to discuss the impact of trade on underdeveloped countries are those of Singer,[1] Myrdal,[2] and

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[1] H.W. Singer, "The Distribution of Gains between Investing and Borrowing Countries", American Economic Review, Papers and Proceedings, May 1950.

[2] G. Myrdal, Development and Underdevelopment. A Note on the Mechanism of National and International Inequality (Cairo, 1956); An International Economy (London, 1956); and Economic Theory and Underdeveloped Regions (London, 1957). These works contain much duplication and the present account relies principally on the third work cited, together with two review articles: G.M. Meier, "International Trade and International Inequality", Oxford Economic Papers, October 1958; and P.T. Bauer, "International Economic Development", Economic Journal, March 1959. There is also Myrdal's recent treatise Asian Drama. An Enquiry into the Poverty of Nations (London, 1968). This restates his earlier positions (see especially Chapters 10, 13 and 14), and his earlier more concise accounts are used here. However, he does lay greater stress on the fact that plantation agriculture has been a sort of "industrialization", which he considers more appropriate for Asian development than is often suggested (see pp. 445-6).

Prebiscch,[1] which date from the 1950's and are highly critical of Classical theory. Their work is a well integrated body of theory, albeit with certain contradictions, and little purpose is served by presenting it in strict chronological order. Accordingly, for expositional purposes Singer is taken to represent their basic position. Myrdal and Prebisch are shown to add certain important qualifications.

Singer notes the considerable importance of foreign trade (in relation to national income) to underdeveloped countries. Labour productivity is much higher in their export industries than in the rest of the economy, and export prospects historically have induced large inflows of capital from abroad. All these, he says, at first sight seem to confirm the Classical view that trade has benefitted underdeveloped countries by raising general productivity, changing their economic structure towards that of a market economy, and spreading knowledge of modern technology and capital intensive production methods. But, says Singer, such export sectors based on foreign investment are not economically part of the country in which they are located geographically.

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[1] Raul Prebisch's writings are scattered over a large number of sources. Three have been chosen: "The Economic Development of Latin America and its Principal Problems", United Nations, Economic Bulletin for Latin America, February, 1962, pp. 14-6 reprinted in G.M. Meier Leading Issues in Development Economics (New York, 1964); Towards a Dynamic Development Policy for Latin America, Chapter 1, pp. 78-88, (United Nations, New York, 1963), reprinted in J.D. Theberge, Economics of Trade and Development, (New York, 1968), and Towards a New Trade Policy for Development, report by the Secretary-General (Prebisch) on the United Nations Conference on Trade and Development (United Nations, New York, 1964). There is also the excellent review article by M. June Flanders "Prebisch on on Protectionism and Evaluation", Economic Journal, June 1964, reprinted in Theberge, op.cit. Flanders relies on other Prebisch sources to those cited above, and thus helps to give a fuller picture.

The investment in export industries certainly has had the multiplier effects (cumulative additions to income, employment, technical knowledge as well as external economies etc.) one would expect, but these have accrued to the investing, not the borrowing country. Again, as with Baran, no proper account is given of the mechanism whereby the multiplier effects by-pass the host economy. Not only does foreign investment give few benefits to the recipient, but it may actually harm it by diverting resources, principally investment and entrepreneurship, from the domestic industry which might otherwise have developed. This is particularly unfortunate because industry yields more growth effects (improved skills, educational effects, technology, creation of new demands and the dynamism accompanying urban civilisation) than do primary products. But there exists, "a third factor of perhaps even greater importance" which has reduced gains from trade and foreign investment. This is that "as a matter of historical fact" the terms of trade since the 1870's have moved in favour of manufactured products and against primary products.[1] Singer gives little analysis of why the terms of trade should have deteriorated, apart from a passing reference to the lack of pressure by primary producers in underdeveloped countries for higher incomes, and the different effects of technical progress on the demands for primary products and manufacturers.[2]

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[1] Singer, op.cit., p. 477.

[2] Ibid., p. 479.

Myrdal's major original contribution is the concept of "spread" and "backwash" effects, although his works also contain accounts of the terms of trade, and of the international demonstration effect.[1] Closely allied to the spread and backwash is the concept of "circular and cumulative causation", which is Myrdal's term for a vicious (or virtuous) circle. Myrdal uses these to explain the phenomenon of inequality between the rich and poor countries. The principles are illustrated by an analysis of regional disparities, which is then applied to the international economy. In fact, regional inequality _per se_ is a key aspect of the explanation of international inequalities. Suppose a region in a country acquires, for reasons of economic geography, or even of historical accident, a competitive advantage over the rest of the economy, e.g. as the centre of heavy industry based on local coal and iron ore. Market forces, says Myrdal, will tend to cluster all economic activity around this area through the workings of internal and external economics, in the widest sense. This is the principle of circular and cumulative causation at work. The region's growth will have both spread and backwash effects on the rest of the country. The spread effects consist of its demand for agricultural products (Myrdal seems to assume that the growth will normally be industrial growth) and possibly investment (perhaps even by the growing

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[1] We do not deal with this at length now, since it is clearly set out in Baran, _op.cit._, p. 68. Of course, this is but a reorientation of Mill's idea that trade stimulates aspirations. Thus it may work as easily to stimulate savings and investments for future consumption as to reduce them for purposes of present consumption.

region itself) in consumer goods industries producing for workers in those areas which supply the centre with agricultural produce. The backwash effects consist mainly of the inducement to factors of production from the rest of the economy to migrate to the growing region. Thus the rest of the economy will be starved of capital (the banking system may accentuate this, by collecting savings in the stagnant areas for use in the growing area), and of the best of its labour force. Also the competitive position of industries in the growing region will inhibit industrial growth elsewhere, and:

> "their entire systems of valuation would take on such an inprint of poverty and backwardness that they would become even less susceptible to the experimental and ambitious aspirations of a developing society."[1]

Analysis can be transferred to the context of the international economy, where western industrial countries are the growing "region". The spread effects consist of a demand for primary products and the backwash effects consist of damage to existing industries of poor countries by imports from rich countries. To understand the problem of underdevelopment fully one must descend to the level of the individual country, since the effects of contact with the international economy work via the country's foreign trade sector. In a poor country spread effects are likely to be relatively weak in contrast to those in a richer country with better transport and communication, higher levels of education, and more dynamic communications of ideas. Thus market forces will work more powerfully to create inequalities.[2]

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[1] Economic Theory and Under-Developed Regions, op.cit., p. 30.

[2] Ibid., p. 34.

It is not clear whether Myrdal thinks trade, on balance, has benefited poor countries. In his discussion of the effects of colonialism,[1] he says that the activities of the colonialist represent a degree of spread of economic expansion which would not otherwise have taken place. He notes that Thailand, which remained independent, did not develop faster than neighbouring Burma, which did not. The roads, ports and railways built by colonial governments represented important advances towards conditions for general economic development, even if little such development occurred. Free market forces were only interfered with in the interests of the colonial power, e.g. in the form of "enforced bilateralism", whereby the colony had to buy and sell in the colonial power's market. Capital, entrepreneurship and skilled labour certainly flowed in with colonialism and export expansion, but relations with the domestic sector were limited to employment of its unskilled labour. Thus, the effects of trade was at worst small, but not harmful. It should be noted that when unskilled labour is drawn into the "enclave", the backwash effects of the enclave are weakened, although it is not certain that such backwash effects are necessarily undesirable. For example, participation in the enclave by small scale domestic capitalists, e.g. as smallholders, might widen the domestic market and promote investment in consumer goods. This sort of argument will be developed later. Elsewhere, however, Myrdal contends that whilst inherited economic theory would suggest that trade starts a movement towards income equalisation, instead:

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[1] Ibid., pp. 55-63.

> "a quite normal result of unhampered trade between two countries, of which one is industrialised and the other underdeveloped is the initiation of a cumulative process towards the impoverishment and stagnation of the latter."[1]

Myrdal's tilt against the windmill of factor price equalisation can be ignored. Factor price equalisation was put forward as operating only under the most restrictive, static assumptions, and one would not expect it to predice accurately the result of processes of growth transmission. His analysis in fact does not explain how an economy becomes impoverished, if only unskilled labour is "backwashed" into the enclave.[2]

Prebisch's work centres on the contention that underdeveloped countries have experienced a deterioration in their terms of trade since the 1870's. In a sense, his position is less extreme than that of Singer and Myrdal. He asserts that the theory of comparative advantages, on which he claims the nineteenth century pattern of trade was based, is sound theoretically. Indeed, if it were not for the falsity of one of its key assumptions, there would have been no need for the "peripheral" (i.e. non-industrial) countries to industrialise. The false assumption is that the benefits of technical progress are shared equally by all members of the international economy. Instead, Prebisch argues, whilst "the centre" (i.e. the industrial countries) was able to keep its productivity gains from itself, the periphery had

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[1] Ibid., p. 99.

[2] Singer's approach does explain this.

to pass on its productivity increases to the centre in the form of lower primary product prices.[1]

Three main explanations for this are given. First is the different effects of cyclical fluctuations on the centre from the effects on the periphery. In the upswing in the centre, where cycles are implicitly assumed to start, prices of industrial and primary products will rise, but primary product prices rise faster (sic). Part of the profits from higher industrial prices are absorbed by wage increases. In the down-swing industrial prices do not fall as much as do primary product prices, since trade union pressure prevents industrial wages falling. Thus the gap between the prices widens over time. But,

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[1] J.N. Bhagwati has shown that it is theoretically possible for a growing country to face such a deterioration in its terms of trade that it is made worse off by growth. This can occur if the rest of the world's offer curve is inelastic and/or if technical change favours the output of the exportable good. Bhagwati assumes that the rest of the world does not grow. See "Immiserizing Growth: A Geometrical Note", Review of Economic Studies, June 1958. J.R. Melvin has shown another case where changing demand conditions in the rest of the world (which now is growing) cause the country to move towards a no-trade position where the reduction of gains from trade outweighs the gains from growth. Bhagwati's case can be avoided by the country imposing an optimum tariff, but Melvin's cannot. See J.R. Melvin, "Demand Conditions and Immiserizing Growth," American Economic Review, September 1969. In "Optimal Policies and Immiserizing Growth", American Economic Review, December 1969, Bhagwati shows that Melvin's case can arise as a result of any change in the foreign offer curve, whether brought about by foreign demand or supply conditions.

says Prebisch, even if there existed at the periphery as great a rigidity as at the centre, it would merely increase the pressure on the periphery. If primary product prices do not contract, stocks of goods will accumulate in the centre, production will contract, and with it the demand for primary products.[1] The periphery income then falls via a fall in employment rather than a fall in price. But, as June Flanders points out,[2] this ignores the fact that income in the centre has fallen also by the same mechanism, whereas if primary product prices fall, this allows aggregate supply to fall, so as to balance aggregate demand. Therefore, if there is wage price rigidity in the periphery as well as the centre, both centre and periphery suffer a loss of income.

The second explanation relates to "productivity ratios and technological densities".[3] In the simple textbook Ricardian comparative advantage model, where labour is the only factor of production (or where at least input proportions are very similar between all goods) a country (say, the periphery) will tend to export goods where the ratios of physical productivity to the wage rate, is higher than the corresponding ratio for the centre.[4] Each country is likely to export a series of

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[1] Economic Bulletin for Latin America, reprinted in Meier, op.cit., p. 343.

[2] Op.cit., p. 30.

[3] Flanders, op.cit., p. 307. The original account is in Prebisch "Commercial Policy in the Underdeveloped Countries", American Economic Review, Papers and Proceedings, May 1959.

[4] Of course, this is only a necessary condition. Not all goods with this productivity surplus will be exported.

goods, and the marginal export good may still exhibit a surplus of the productivity ratios over the wage ratio. The difference between the productivity surplus of the best and the marginal export good will be transferred abroad in the form of lower export prices.[1] The less the difference in productivity surplus between each successive export good, the less will be transferred abroad as exports increase. Prebisch contends, Flanders argues, that the productivity ratios in the periphery are further apart (i.e. less "dense") for each successive export good than in the centre. She argues also, that greater gain accrues to the centre if, in addition, only at the periphery are there no factors other than labour (which in relative terms at least, is a plausible assumption). Returns to these other factors could prevent transfer of part of the productivity surplus. The third and apparently definitive version,[2] is in terms of long run demand trends and the ability of underdeveloped countries to switch resources, although he does attribute a subsidiary role to protection in industrial countries.

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[1] For an explanation of this process, see F.D. Graham, "The Theory of International Values Re-Examined", Quarterly Journal of Economics, November 1923, reprinted in American Economic Association, Readings in the Theory of International Trade, (Homewood, Illinois, 1950), especially pp. 311-312. Flanders cites Graham, but does not summarize his analysis. For a good survey of Graham see R.E. Caves, Trade and Economic Structure, (Cambridge, Massachusetts, 1960), pp. 44-57.

[2] This is contained in Prebisch, Towards a Dynamic Development Policy for Latin America, op.cit., which he has written as an elucidatory synthesis of his ideas and those of the Economic Commission for Latin America Secretariat, under whose auspices much of his work has been presented. It is very similar to his later position in the UNCTAD report.

World demand for primary products has been growing less rapidly than that for industrial products, and underdeveloped primary producing countries have not been able to switch resources sufficiently rapidly out of primary products. This need for displacement is intensified by any productivity increases which occur in the primary sector. If productivity rises in that sector, but labour is not absorbed into the urban sector, wages in the agrarian sector will not rise. The consequent rise in profits will induce an increase in production which will force down the price of primary products in relation to industrial products. This passes on the gain in productivity to consumers in industrial countries (and to the non-agricultural domestic sector, to the extent that it consumes domestic agricultural products). In contrast, in the centre, labour is more easily reallocated. Industrial goods usually have a high income elasticity of demand and new products appear when old products' sales slow down. Moreover, the proportion of the work force in the centre in agriculture is small and so there is little of the downward pressure on wages in the urban sector which would occur if large amounts of labour had to be absorbed into urban employment. The absence of such pressure makes it easier for trade unions to raise wages as productivity rises.

June Flanders has tried to show that much of Prebisch's analysis is unnecessary. A sufficient condition for terms of trade deterioration, she says, is that income elasticities of demand for primary products and for manufacturers should differ. In Flander's minimum Prebisch model the centre (C) and periphery (P) are each assumed to have equal rates of population growth, per capita income, (and therefore productivity and real wages) and technological density. C exports manufactures and P

primary products, although both produce both products domestically. In these circumstances, the difference in world income elasticities ensures a growing balance of payments deficit for P, which can be cured only through a deterioration in its terms of trade. In effect P must shift its growing labour resources into industrial activity, but for its own industrial products to compete with imports, its foreign exchange rate must depreciate or its wages fall, thus, part of P's productivity gains are transferred to C.[1]

Flanders sees two reasons why the terms of trade deterioration might stop. First, P's labour force is to an increasing extent employed in industry, so demand for imported manufactures should fall. Second, the terms of trade deterioration means a slow growth rate of per capita incomes in P, so even with a high income elasticity of demand for imports, imports should eventually fall in absolute terms to the level of exports.[2] Finally, Prebisch has noted elsewhere,[3] that while such balance of payments difficulties can be solved by devaluation, devaluation involves an over-expansion of the export sector relative to the social optimum for the country. This is because primary producers treat foreign demand as infinitely elastic and therefore equate marginal cost to price, instead of to marginal revenue, thus, over-expanding output. Flanders attacks this on the grounds that if free

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[1] Flanders, op.cit., p. 317.

[2] Ibid., p. 318.

[3] "Commercial Policy in the Under-Developed Countries", op.cit., cited by Flanders.

market forces dictate an increase in exports, present income is maximized. This may yield a higher income over time, in the form of a lower rate of growth applied to a higher absolute level of income. However, it is not clear whether Prebisch's social optimum is a static or a dynamic one, although Flanders obviously interprets it as the latter. If it is a static concept, (i.e. if the expansion of exports following devaluation lowers present income not the growth rate of income) then her argument does not hold, and devaluation might involve a lower level of income at every point of time as well as a lower growth rate.

The overall picture presented by these critics of the Classical position is that of an enclave situated geographically, but not economically, in a poor country. Income earned in the export sector flows abroad, either as remittances or as imports,[1] and the domestic economy is little affected, except as a provider of unskilled labour. In Singer's and Myrdal's exposition this is allied to the idea of terms of trade deterioration. Surely there is an inconsistency here.[2] If the host country does not benefit at all from the enclave, it matters not at all that the benefits from the trade are transferred abroad! All that happens is that the transfer of benefits to the centre takes the form of

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[1] In this connection, it is worth mentioning J.V. Levin, The Export Economies. Their Pattern of Development in Historical Perspective (Cambridge, Mass. 1960). This is a theoretical study with extensive empirical examples, taken from Burma and Peru. Levin distinguishes "foreign factors" and "luxury importers", the former being factors who remit their earnings overseas.

[2] This inconsistency does not exist in Prebisch, since he concerns himself with the terms of trade rather than the other effects.

lower prices to the consumers, in the centre, rather than higher returns to the investors themselves.[1] The answer is that there are benefits to the host country from the enclave, for example, participation by domestic smallholders, as already mentioned. Whether these benefits are sufficient to promote widespread economic development is of course another question.

The Singer-Myrdal-Prebisch position has been the subject of much attack. For example, P.T. Bauer has argued that enclaves are a focal point of development, and that the concept of an enclave is designed solely to give a spurious reconcilliation between the "vicious circle of poverty" and the existence of manifest evidence of widespread economic progress in underdeveloped countries.[2] Cairncross has argued that it is difficult to see how dynamic influences can be contained completely within an enclave, and asks by what magic a steel mill producing for the domestic market could revolutionize an economy when an export good could not.[3] Boris C. Swerling has pointed out the importance of the

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[1] Of course, the difference would be significant for an independent underdeveloped country engaged in promoting economic development, but, in Singer particularly, it is past experience which is being discussed as mcuh as current policy.

[2] "International Economic Development", op.cit., p. 113.

[3] A.K. Cairncross, "International Trade and Economic Development", Economica, August 1961, reprinted in Cairncross Factors in Economic Development (London, 1962).

foreign trade sector as an easily available source of tax revenue in economic systems where scarce administrative skills must be carefully husbanded.[1] Others have responded by restating the Classical position.[2] The terms of trade doctrine have also been widely attacked, and the arguments against it are now commonplace. A decline in the ratio of export to import prices (barter terms of trade) does not necessarily mean a decline in the factorial terms of trade, i.e. the terms of trade allowing for productivity changes. So poor countries need not have lost all of their productivity gains. Nor need the income terms of trade have deteriorated. The fall in price does not necessarily mean a drop in total revenue from exports. Moreover, many of the arguments are based on price series of British imports and exports, yet poor countries export a wider range of products than those imported by Britain. The decline in primary product prices may reflect a decline in ocean freight rates at the end of the last century also. In any case, it is invalid to lump together the experience of all poor countries: some may have gained even if others lost.[3] Also, much attack has been levelled at the Singer-Mydral-Prebisch policy recommendations, usually various forms

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[1] "Some Interrelationships Between Agricultural Trade and Economic Development", <u>Kyklos</u>, 1961, p. 385.

[2] See Subsection 1vi, "Modern Classical Theories".

[3] For a full statement of the terms of trade arguments see G.M. Meier, <u>International Trade and Development</u> (New York, 1963), Chapter 3, and its second edition re-titled <u>The International Economics of Development</u> (New York, 1968), Chapter 3.

of protection for domestic industry. Policy is discussed below in Subsection 3vii.

These are extreme explanations, which come near to saying that poor countries have been impoverished as a result of export expansion and foreign investment. Nevertheless, it is clear that many countries which are still regarded as underdeveloped experienced large expansions in exports in the nineteenth and early twentieth centuries, without achieving the widespread economic growth of such countries as Canada. We now turn to less extreme explanations of the phenomenon.

II - 3iii Other Explanations of Limited Economic Development

Three major contributions are considered under this heading: those of Meier,[1] Myint,[2] and Baldwin.[3]

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1 G.M. Meier, "The Problem of Limited Economic Development", Economia Internazionale, No. 4, 1953, reprinted in A.N. Agarwala and S.P. Singh, The Economics of Underdevelopment (New York, 1963); "International Trade and International Inequality", Oxford Economic Papers, October 1958; International Trade and Development, op.cit., and The International Economics of Development, op.cit.

2 H. Myint, "An Interpretation of Economic Backwardness", Oxford Economic Papers, June 1954; "The Gain from International Trade and the Backward Countries," Review of Economic Studies, 58, 1954-5; "The 'Classical Theory' of International Trade and the Underdeveloped Countries", op.cit.; "Economic Theory and the Underdeveloped Countries", Journal of Political Economy, October 1965; The Economics of the Developing Countries (Third edition, London, 1967).

3 R.E. Baldwin, "Export Technology and Development From A Subsistence Level", Economic Journal, March 1963. There is also, "Patterns of Development in Newly Settled Regions", op.cit., discussed in Subsection 2iii. Baldwin has attempted to test his theory in Economic Development and Export Growth. A Study of Northern Rhodesia, 1920-1960. (Berkeley, California, 1966).

Meier's argument is set out in his first article "The Problem of Limited Economic Development"[1] and elaborated over a period of fifteen years. The problem he discusses in the first article is why during the large expansion of international economic activity from 1870 to 1913, some countries did not achieve sustained development. What Meier is interested in is not primarily the causes of growth, but the obstacles to growth. Although political and sociological attitudes are an important possible obstacle, Meier thinks there is much to say about development in purely economic terms. He dismisses the possibility that development was hindered by lack of resources or by overpopulation. Most underdeveloped countries were not overpopulated in the 1870's, and overpopulation only makes development problems different in degree not in kind. The economic literature, he says, lists three main obstacles: market imperfections, the vicious circle of poverty, and the repercussions from foreign investment. Market imperfections include imperfect knowledge of resources, techniques, and market conditions, lack of mobility, specificity and indivisibility of factors of production. These imperfections are not important in the sense of deviations from a static optimum, since far more than the fulfilment of optimum conditions is necessary for development. What is necessary for development are large non-marginal changes, and the latter can be affected by imperfections. The vicious circle of poverty is the familiar idea, often associated with Ragnar Nurkse,[2] that low incomes

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[1] Op.cit.

[2] See for example, Problems of Capital Formation in Underdeveloped Countries (London, 1953).

lead to low savings and investment, which in turn leads to low income. Meier clearly feels that underdeveloped countries' main chance to break out of the vicious circle came through the expansion of their exports and the associated inflow of foreign capital. However, increases in the supply of exports were not translated into increases in demand for products made by the domestic economy. In plantations labour was employed at low wages due to its highly elastic supply (Meier does not say what happens in the case of mining ventures). Where populations were too dense to permit plantation methods, peasant smallholdings were supplied with credit, marketing and transport facilities, but it is claimed by many writers that their gains were lost to monopsonistic buyers of their produce and to monopolistic sellers of imports to them. He himself is not sure whether the claims are true.[1] Also there were substantial leakages in the form of profits and high imports, including imports by indigenouspeople influenced by the international demonstration effect.

At first sight Meier's position is similar to that of Myrdal and Singer. However, in his later article, "International Trade and Internation Inequality", which is a review of three works by Myrdal, he takes issue with Myrdal's contention that trade has promoted inequality, and provides a more optimistic interpretation of the role of trade. Trade, says Meier, has not promoted an "unbalanced" economic structure as Myrdal contends. Foreign investment and entrepreneurship has not been competitive with domestic investment or entrepreneurship.[2] There

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1 Op.cit., pp. 68-9.

2 Op.cit., p. 279.

is no evidence to show that the latter would have been greater in the former's absence. What impeded domestic economic activity were obstacles of the sort listed in Meier's earlier article - market imperfections, and values minimising incentives for economic change.[1] Moreover export growth <u>did</u> have more favourable effects than Myrdal (and Singer) allow. It resulted in considerable movements away from subsistence farming towards active participation in commercial production or wage earning.[2] Also, even the large inflows of cheap foreign labour, although keeping wages low did at least allow an expansion of exports. If it did not succeed in propelling the rest of the economy forward this was because of the domestic obstacles, the lack of preconditions of the sort which existed in Japan, Canada, the United States and Sweden, and which allowed those countries to grow with trade. Meier also takes issue with Myrdal's recommendations for protecting industry. Meier is not sure whether returns to investment are in fact higher in industry in underdeveloped countries (in contrast to industry in a rich country) than in domestic agriculture.[3] He also dislikes Myrdal's reliance on the assumption that disguised unemployment of labour exists in agriculture, which labour can be transferred to industry with no loss of agricultural output.[4] In any case, even if the notion of disguised unemployment is allowed, labour mobility (which Meier assumes to be the

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[1] <u>Ibid</u>., p. 284.

[2] <u>Ibid</u>., p. 283. See also P.T. Bauer, <u>op.cit</u>.

[3] Meier seems to equate exports with agriculture, and it is not always clear which he refers to.

[4] For a penetrating criticism of the disguised unemployment idea see H. Myint, <u>The Economics of the Developing Countries</u>, <u>op.cit</u>., pp. 86-90.

aim of protection, and which presumably is to take the form of movements into industry) is better stimulated by such means as public investment in social overhead capital, in education and training, and policies fostering cultural change. Meier feels that with domestic obstacles removed, trade itself could play a more important propulsive role. This position is repeated in his excellent surveys of the trade and development literature in his two books cited above.[1]

Myint's starting point is an attack on the indiscriminate lumping together of "underdevelopment" and "backwardness".[2] He draws a distinction between "underdeveloped" resources and "backward" people, "backward" to be interpreted in an economic sense only. Poverty is connected with backwardness. The mere development of resources does not necessarily help backwardness and may indeed worsen it. Backwardness is a term which only suggests itself when a primitive or mediaeval economy is opened up to contact with outside economic forces.[3] It has meaning in a relative rather than an absolute sense.

Myint suggests three possible explanations of backwardness.[4]

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[1] Following the practice in this chapter of not surveying the surveys, these accounts are not outlined here. It is worth noting however that Meier is one of the few writers to recognise the relevance of staple theories of growth to general trade and development problems.

[2] "An interpretation of Economic Backwardness", op.cit.

[3] Ibid., p. 133.

[4] Since backwardness manifests itself only after contact with the outside world, explanations of backwardness must say why such contact did not promote widespread growth. Myint offers no explanation of why countries were poor before outside contact, except for a reference (p. 145) to overpopulation in some cases. Backwardness is simply accepted as the initial situation.

The first is overpopulation. Although this could be an explanation in some cases, many backward countries, when opened up to outside contact, had sparse populations relative to natural resources. Outside contact may have raised population growth,[1] but in other cases it retarded it.[2] A second explanation is deliberate and legalised discrimination against backward people. However, whilst this occurred in some cases it is not necessary as an explanation of backwardness. Myint suggests that the real explanation is the way in which backward countries were opened up to trade.

To illustrate the argument, a verbal model is constructed. There is a sparse population in relation to natural resources, local people enjoy full legal rights in their economic relations, and development of the economy takes the form of specialization on a few primary products for export, usually by foreign private enterprise, possibly aided by government. From the model Myint shows how the gains from trade were lost to the indigenous people. His argument is expanded in each of his subsequent articles and the book cited above. It is made increasingly clear in the later works that the explanation (and the accompanying

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[1] Myint is inconsistent here, in that he says that the raising of population growth as a result of outside contact is not an explanation of backwardness. Surely it is one explanation. However, Myint's aim is to show that other causes are more important.

[2] Malaya in its early stages of development may be such a case, although the retardation was masked by immigration. It has been argued that unhealthy working conditions in the export industries led to such a high death rate that population would have declined in the absence of immigration. See D.J. Li, British Malaya. An Economic Analysis (New York, 1955), pp. 72-73.

policy recommendations) applies only to the (usually small) "export economies" (such as Malaysia), which by definition derive a high proportion of national income from exports and which do not generally suffer from population pressure.[1] This is in contrast to large overpopulated countries typified by India. Myint says many underdeveloped countries fall into his category: most of South East Asia, and much of Latin America and Africa. A composite account of Myint's theory is now presented, integrating his various works wherever possible.

The "opening up" process had three characteristic aspects: the nature of the specialization by indigenous people in export production, the monopoly powers of foreign enterprise, and the role of non-indigenous middle men. Indigenous people participated in export production either as labour for foreign mines and plantations or as peasant producers. These shifts in their economic activity to export production did not involve any specialization in the sense of greater specificity to export production with consequent rises in productivity. The labour supplied was unskilled and could be used in virtually any form of export activity. Similarly peasant exports depended for their success on the fact that they involved no radical changes in techniques.[2] Thus there was little source of gain to the backward people in the sense of higher

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[1] In fact, some small export economies do suffer from population pressure, e.g. Ceylon. Here Myint's explanation of past development would be little affected, but his views on their development prospects would be less hopeful. See The Economics of the Developing Countries, op.cit., p. 158.

[2] "An Interpretation of Economic Backwardness", op.cit., p. 153.

productivity. The lack of increase in physical productivity[1] was accentuated by the weak economic position of the backward people in relation to foreign buyers of labour or produce and foreign sellers of imported goods. In some cases foreign firms were granted monopolies to induce them to take the risks of investing in a poor country and in others their natural advantages, e.g. the large minimum size of investment for certain mining concerns, easily gave them monopolistic positions. Further, often contact between advanced and backward people was broken by middle men, often Chinese and Indians, who collected produce and sold imports.

These of course are the static gains. Whether the backward people lost because export production was of primary products not manufactures Myint is not certain. Although it is often argued that primary production yields less dynamic gains (in the form of external economies, educative effects, and so on), he feels that this is making a comparison of the advanced manufacturing in rich countries with the backward agriculture in poor countries. In fact, the development of industry with the same cheap labour policies as were followed by primary producers might have resulted in even smaller static as well as dynamic gains to the poor countries. Also, it is just as easy for the second

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[1] This comparison in terms pf physical productivities is at best a crude and at worst an invalid method of approach, since one cannot compare meaningfully physical productivities in two occupations producing different products. However, the expansion of Burmese rice production for export illustrates the case in point, and the expansion of other cash crops is analogous. Analogous also is the idea of moving unskilled labour from a domestic to an export occupation.

round of demand created by industry to be lost abroad as it is in the case of primary production, if domestic "preconditions" for growth do not exist.[1]

It is easy to understand why participation by local people in mining and plantation products should have been limited at first to employment as unskilled labour. Obviously they were "raw" and completely unused to Western methods, and there was a high turnover as workers returned periodically to their villages. Less easy to explain is why they did not acquire skills over time and move into higher paid jobs.[2] Myint suggests that this was due to a deliberate "cheap labour" policy pursued by foreign enterprises. Initial experience, combined with pressure in some cases from European trade unions, fostered a convention of "vertical" division of labour into non-competing racial groups. Moreover, firms wishing to make a more intensive use of labour face the risks of tying up more capital in machinery and in accommodation facilities, in contrast to the working capital which was normally all that was necessary, and which often had a very rapid turnover.[3] The particularly important consequence of the fossilising of the cheap labour policy arose when it was necessary to raise export production, and adequate supplies of local labour were not forthcoming at existing wage rates. It is widely believed that local labour had a backward

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[1] "The Gains From International Trade and the Backward Countries", <u>op.cit</u>., p. 139.

[2] That this did not occur is an assertion of Myint's. Baldwin's study of Northern Rhodesia showed that some acquisition of skill by Africans did occur in copper mining (see Baldwin, <u>op.cit</u>., p. 145).

[3] This would be much truer for, say, tin mining than for rubber growing.

sloping supply curve and therefore a rise in wages would not increase supply.[1] Hence large numbers of immigrant labourers were introduced, thereby keeping wages down to the level appropriate to the overpopulated areas, such as India and China, from which most of these labourers came.

One may now ask to what extent Myint's account, which is characterised by a refreshing lack of polemics, supports the Singer-Myrdal-Prebisch hypothesis that trade has impoverished underdeveloped countries. First, Myint has described the rise in export production in terms of the vent for surplus principle propounded by Adam Smith.[2] This states that the rapid growth of export production was made possible not primarily by a switch of resources from other employments but by the mobilisation of new resources which were not employed previously. This explanation is

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[1] This reasoning is erroneous. Because a fall in wages induces more work to maintain living standards, it does not mean that in the long run a rise in wages might not raise labour supply by presenting a more lucrative alternative to subsistence agriculture.

[2] See Myint, "The Classical Theory of International Trade and the Underdeveloped Countries," op.cit.

best suited to peasant exports, where the pre-existing surplus was of both labour and land.[1] Labour time was not fully utilised because the lack of domestic market opportunities gave peasants no incentive to produce beyond their own immediate needs. Surplus resources enabled peasants to produce for export, initially, in addition to their own subsistence production, thus spreading their risks. Surplus labour and land allowed large rises in export production far in advance of population growth. Thus, for Myint, there is no question of export production diverting resources from potentially more productive domestic

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[1] It is interesting at this point to recall the attempt by R.E. Caves, "'Vent for Surplus' Models of Trade and Growth", cited in Subsection 2iii which tries to integrate Myint's approach and the staple approach in terms of a generic vent for surplus model. Caves says Myint's approach is essentially a vent for surplus model involving surplus labour, in contrast to the surplus natural resources of the staple theories. He is careful to point out that Myint's own model actually involves both surplus labour and surplus natural resources, but Caves feels that this, while interesting, does not alter the general applicability of the labour venting principle to poor countries. In fact, it has crucial significance for peasant exports. If extra land is not readily available for increased exports, production cannot expand rapidly with existing techniques. Thus Indonesia expanded rubber exports rapidly in the past, but more recently population pressure has become acute in Java and has induced peasants to return to subsistence production. See Myint "The Classical Theory of International Trade and the Underdeveloped Countries", <u>op.cit.</u>, p. 332. Also, the surplus labour in a country with no land surplus is of the "zero marginal product of labour" variety. This did not exist in the kind of countries Myint describes. Indeed, Myint is careful to restrict his Vent For Surplus principle to surplus natural resources in the case of mining and plantation exports on these countries, since those exports clearly depended on immigrant labour. (See <u>ibid.</u>, p. 326). Caves' model restricts itself to considering the operation of an equilibrating mechanism after the discovery of the surplus labour or natural resources. This equilibration is superimposed either on a static or on an autonomously growing economy whose underlying growth rate is not affected.

pursuits. Indeed, in his later work[1] he is very optimistic about the potentialities of the primary product exports, including their sales prospects if prices are reduced by productivity increases. If peasant exports were expanded without changes in techniques,[2] there is much scope for improvement of productivity by applying more capital and technological resources. Malaya, he says, is a good example of a country doing this.[3] Indeed, not only do peasant exports have great development potential but the mining andplantation sector could become the spearhead of modern technology and improved methods. However, in some cases, e.g. Zambia, it has been inhibited by a high wage policy for domestic labour forced on it by new nationalistic governments. This has raised wages far above productivity and stimulated excessively capital intensive methods, thereby going to the other extreme from the cheap labour policy of earlier days.[4]

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1 "Economic Theory and the Underdeveloped Countries", op.cit., and The Economics of the Developing Countries, op.cit.

2 Robert Szereszewski in his study of trade and growth in Ghana suggests that the expansion of cocoa exports was accompanied by technological innovations as well as capital formation on a large scale. Both of these he contrasts to the Myint position, although in fact Myint clearly realises that the use of surplus labour, whose opportunity cost is leisure time, does involve capital formation. See Structural Changes in the Economy of Ghana, 1891-1911 (London, 1965), p. 77.

3 The Economics of the Developing Countries, op.cit., p. 158. This view is supported in the influencial book by H.G. Johnson, Economic Policies Towards Less Developed Countries (London, 1967), p. 70.

4 See The Economics of the Developing Countries, op.cit., pp. 56, 65-66, 156. This is akin to the explanation of Italian dualism put forward by Vera C. Lutz in "The Growth Process in a 'Dual' Economic System", Banca Nazionale del Lavoro Quarterly Review, September 1958. This is considered more fully later, in Subsection 3v.

Finally, Myint's introduction of a distinction between peasant export production and export production carried out by foreign enterprises makes it opportune here to add some elucidatory comments on the distinction between: a) foreign investment on the one hand and growth in exports _per se_, and b) between the growth of incomes of the indigenous people and those of immigrants. Where an export industry has been developed by foreign enterprise and capital, the effects of export growth essentially are those of the foreign direct investment. In principle, these are the same effects as would be generated by a rise in domestic investment in the export industry, so long as such investment were due to an increase in savings and was not a diversion of investment funds from elsewhere in the economy.[1] There are the same increases in wage employment opportunities for the local population (the extent of wage rises depending to some extent on the elasticity of labour supply), and the purchases and sales of intermediate products by the export sector offer "linkages" which may increase domestic capital formation and economise on the supply of entrepreneurship. However, foreign enterprise is likely to introduce greater technical knowledge of production techniques. Also, foreign enterprise may, as it were, "show the way" to local people to produce for export. This was almost certainly the case with smallholder rubber in Malaya, although it is clear that in other cases, e.g. Ghana at the turn of the century, peasant producers needed much less of a stimulus, perhaps because the lower gestation period for cocoa in comparison to rubber reduced risks. As Myint has shown prod-

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[1] Except that the return on capital would accrue to foreigners and profits might therefore be remitted abroad.

uction of exports by domestic people was more likely when there was little change required in techniques or factor proportions.

Second, Myint focuses attention on the effects on the income growth of indigenous people. It may be reasonable to exclude gains to Europeans, who would normally expect almost from the start rewards at least as high as in their home countries. It is less reasonable to exclude the long-run growth of incomes of the immigrant unskilled labour which was an important factor in the economic development of Malaya. Of course, this raises the problem (which applies also to staple theories) of distinguishing the growth effects of immigration from those of exports. Immigration is likely to raise aggregate output and under some circumstances output per head also. However, it is possible to separate logically if not empirically the effects of export growth once immigration has taken place from those of new immigration.

Baldwin's theoretical articles are interesting syntheses of many strands of the trade and development literature, and represent as nearly a definitive contribution as exists at present. His earlier article, "Patterns of Development in Newly Settled Regions" has been presented in Subsection 2iii, and influenced the development of staple theories. His second article "Export Technology and Development From a Subsistence Level"[1] combines description of the mechanisms of the staple theory, which are nowhere as clearly outlined in the literature on underdeveloped countries, with an understanding of how these mechanisms may work in an underdeveloped country. Richard Caves has

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[1] Op.cit..

argued[1] that the growth effects of an export depend crucially on the externalities it produces. Baldwin has provided a theoretical analysis of these externalities.

Baldwin notes that underdeveloped countries are generally characterized by striking disparities in technology between sectors within an economy. Such disparities date from the introduction of new lines of production for export following contact with Western economies. Since advanced productive techniques are necessary for significant rises in income levels it is necessary to study the way in which new techniques spread through the rest of the economy.[2] It is not clear whether Baldwin wishes formally to equate capital formation with improved technology. He seems to imply either that capital formation with a given technology does not raise income or that the two normally go together to such an extent as to be logically inseparable. The latter position, one may note, is that taken by certain recent growth theorists.[3] [4]

The establishment of particular exports depended on comparative cost considerations, taking into account factor movements. Unskilled labour and many natural resources were, at existing exchange rates, at the time of economic contact much cheaper in underdeveloped countries than in advanced countries. Therefore the industries which were

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[1] "Vent for Surplus Models", op.cit., pp. 110-115.

[2] "Export Technology", op.cit., p. 80.

[3] The best known example is N. Kaldor. See his "A Model of Economic Growth, Economic Journal, December 1957, reprinted in Kaldor Essays On Economic Stability and Growth, (London, 1960).

[4] The meaning of "technology" and its relation to capital formation is discussed in Section 2 of Chapter VI.

established were those using some or all of these factors intensively. In the case of mineral exports, with high capital and skilled labour coefficients, the natural resources had to be very cheap to offset these other costs. The heart of Baldwin's argument is that the spread effects of the export good are determined significantly by the technological nature of that good's production function,[1] including both input coefficients and the possibility of economies of scale. In fact, the spread effects also depend on the production function of goods supplying and supplied by the export sector.

As was shown in Section 2, a variety of linkages can be offered by an export good, or indeed by any expanding sector.[2] The production function of the export good offers such linkages and it also conditions the response of domestic factors to those opportunities. Thus market opportunities for food growing for the export sector offer an inducement to cash crop production, the higher income from which provides savings for additional capital formation. Improvements in the quality of the local labour force allow introduction of new techniques requiring those skills.[3] The approach is best illustrated by Baldwin's examples of the

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1 Ibid., p. 84.

2 The significance of the export sector of course is that its expansion is not limited by the size of the domestic market.

3 Presumably local people first have to leave the agricultural sector and then return to it after they have acquired labour skills. Actually Baldwin's food example, "Export Technology", op.cit., p. 85, seems unconvincing, as he writes later, (p. 87) that people leaving the plantation sector are not able to set up successfully, i.e. not able to continue to raise their incomes, on their own as smallholders. This is mainly because of the economies of scale in plantation agriculture and the consequent need for large amounts of capital for efficient operation.

different effects of plantation and mining exports.

Plantation exports require large quantities of unskilled labour, large amounts of capital (because of economies of scale), and a small number of technical and managerial staff, whose considerable skills locals find difficult to attain. The large wage bill could provide a large domestic market for simple consumer goods, but because of lack of labour skills, local people are not able to set up as entrepreneurs on their own. On the other hand such industries are unlikely to require complex capital and material inputs. Often capital goods (as opposed to circulating capital) may consist mainly of construction outlays. The production functions for such capital goods use inputs more nearly in the proportions available domestically. Thus, brick, cement, and timber are not highly using of skilled labour. Moreover, they can be produced efficiently on a small scale, and are protected from imports by high transport costs,[1] In contrast, mining exports often require higher degrees of labour skill, which locals can acquire over time. However, in spite of their higher per capita income the mining workers are not sufficient in number to provide a large domestic market. On the other hand, they may be able to set up as entrepreneurs to supply goods to the export industry.[2] The capital good and input requirements of mining exports were often complex. They had to be imported since

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[1] Ibid., p. 88.

[2] Ibid., p. 87. Baldwin notes that it was normally foreigners who acted in this fashion, but the mechanism described could also lead to similar action by locals.

their production was more suited to factor supplies in advanced countries. Similarly, processing of the export good depends on how well domestic factor supplies match processing input coefficients.

Baldwin's argument could be paraphrased thus: domestic production of goods supplying the export sector or using the export good as an input, can be established if domestic factor supplies are not too divergent from input requirements.[1] However, neither must the match be too exact if growth is to occur. Room must be left for qualitative changes in factor supplies, e.g. the requirement must be for moderately skilled labour, which the domestic economy can hope eventually to provide. He places great emphasis on technological externalities of which labour training is the most likely to occur. Pecuniary externalities, he says, are only the normal signals of the price mechanism in an efficiently allocated economy.[2] However, they may be useful for overcoming certain imperfections, such as the "lumpiness" of capital goods.[3] Baldwin places little stress, at least in his second article, on the fact that if savings depend on investment opportunities,

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[1] J.R.T. Hughes, "Foreign Trade and Balanced Growth: The Historical Framework", American Economic Review, Papers and Proceedings, May 1959, suggests that a major reason for Western countries' successful response to trade stimuli was the ability to respond to the new factor combinations required for exports or industries complementary to exports.

[2] The distinction between pecuniary and technological external economies is set out clearly in T. Scitovsky's famous article, "Two Concepts of External Economies", Journal of Political Economy, April 1954, reprinted in Scitovsky, Papers on Welfare and Growth, op.cit. This is cited also by Baldwin.

[3] "Export Technology", op.cit., p. 90.

then pecuniary externalities may involve increases in capital formation.[1]

Baldwin is rather pessimistic about development through export growth. Plantation economies create potential markets for consumer goods by employing large quantities of labour, but they do little to improve such labour or educate it to respond to investment opportunities. On the other hand, mineral exports require labour skills, but do not

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[1] See Section 2. Whether savings do depend to any significant extent on investment opportunities is an empirical question which cannot be settled by *a priori* argument. C. Wolf and S.C. Sufrin, in *Capital Formation and Foreign Investment in Underdeveloped Areas* (Syracuse, 1955) produce some interesting discussion on this point. After criticising the "traditional" model of underdeveloped countries, where the problem is one of low capital formation due to low savings and incomes, they argue: "There are good reasons for doubting - at least in enough cases to be significant - whether, in many cases, it is the shortage of total resources which restricts productive capital formation, or whether it is rather the shortage of a key or strategic resource which inhibits the utilisation of resources that are available for investment. Stated more specifically, frequently, in underdeveloped economies, the supply of savings is a less significant limitation on the rate of productive investment than is the demand for capital" (p. 11). They put forward the following evidence for their view: first, the accumulation of internal cash balances through government fiscal transactions, balance of payments surpluses resulting in growth of foreign exchange reserves, and outward movements of capital made by wealthy citizens suggest the existence of savings. Second, they suggest that the proportion of income spent on ceremonial expenditure (they quote a figure of 7% for India) indicates the presence of potential savings, or at least a margin over subsistence. They also cite evidence for Indonesia and Turkey (p. 13) indicating very high marginal rates of savings in response to investment opportunities. A.O. Hirschman appears to share their opinion. See *The Strategy of Economic Development*, *op.cit.*, Chapters 1 and 2. Indeed many of Hirschman's proposals for unbalanced growth are based on this assumption. He feels the drawback to development is not the supply of savings but the ability to make economic decisions.

provide a large enough market for consumer goods and confine higher incomes to a small number of people. He adopts a dismissive attitude towards peasant exports. In contrast to Myint, he does not see in them any potential for improved productivity. In fact, if productivity in peasant exports can be improved a potential market for consumer goods is created, especially if the previous development of exports improves the transport system in such a way as to widen the domestic market.

II - 3iv Other Work on Trade and Growth in Poor Countries

The works outlined so far in this section constitute the main stream of thinking on trade and development. Very briefly a number of other contributions now are summarized which do not fit neatly into the structure but which nevertheless make worthwhile points.

K. Berill[1] has attacked current growth models which assume a closed economy and only two sectors (a consumption good and a capital good), and place an accent on capacity rather than demand.[2] He presents a verbal model of a backward, predominantly agricultural country, where the market is small and is reduced further by high transport costs. He shows how an expansion of exports, due to a boost either from the supply side, e.g. technical improvements, or from the demand side, could lead to industrialisation via domestic develop-

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[1] "International Trade and the Rate of Economic Growth", Economic History Review, April 1960.

[2] For a discussion on macro export-growth models, see Subsection 3vi.

ment of processing or consumer goods industries. He suggests that this may not happen in an enclave economy. The analysis adds little to existing work.

J.E. Haring has shown that where a country can attach itself to the growing market of a rich country, export growth in consumer goods can occur, with large inflows of foreign capital.[1] He has also produced an interesting survey of the trade and growth literature,[2] and a macro-economic model of trade and growth which is dealt with in Subsection 3vi.

David L. Gadiel has presented an interesting empirical study of trade and growth in Papua - New Guinea.[3] This is an economy of the type described by Myint. Much of its income from export has flowed out again and Gadiel feels that the future of the country would depend much on it acquiring new labour skills.

Eric Clayton has described enclave development in Kenya.[4] The enclave which Clayton discusses is a European food producing sector. He feels more spread effects would be produced if the sector were taken over by africans, who would produce African (instead of European) food in excess of their own requirements. This food could be sold to other

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1 "External Trade as an Engine of Growth", Economia Internazionale, February 1961.

2 "Dynamic Trade Theory and Growth in Poor Countries", Kyklos, fasc. 3, 1963.

3 "International Trade and Economic Development in Papua - New Guinea," Economic Record, June 1966.

4 "A Note on the Alien Enclave and Development", East African Economic Review, June 1963.

African provinces, which then could concentrate exclusively on cash crops for export. The resulting rise in African incomes would increase the domestic market for non-agricultural consumer goods.

Albert Hirschman has made significant contributions to many branches of economic development theory.[1] Much of his analysis of linkages has already been used here. He also has presented an analysis of international and interregional transmissions of growth, which is sufficiently close in approach to Myrdal's not to require a separate exposition.[2] He also has suggested that imports are a useful means of creating domestic demand, which can later be met by domestic production.[3]

Charles P. Kindleberger has provided a number of useful qualifications to the theory, based on European historical experience.[4] He

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[1] Especially, The Strategy of Economic Development, op.cit.

[2] Ibid., Chapter 10.

[3] Ibid., p. 123.

[4] Foreign Trade and the National Economy. (New Haven, 1962), Chapter 12, presents a summary of his views. Also very useful is "Foreign Trade and Economic Growth. Lessons from Britain and France, 1850-1913", Economic History Review, No. 2, 1961, reprinted in Theberge, Economics of Trade and Development, op.cit; and some points of interest can be found in "Foreign Trade and Growth. Lessons from British Experience to 1913", Lloyds Bank Review, July 1962.

shows how export can be a leading, balancing, or lagging sector. The first case is more or less that of the North version of the staple theory, although Kindleberger gives some interesting examples on present day Europe.[1] Trade can act as a balancing sector and thereby overcome the need for "balanced growth", in the sense of the need for investment in a wide range of goods because of domestic market limitations for any one good. It can also act as a constraint, in the sense of providing insufficient foreign exchange for imports required for a domestic growth programme. More interesting than these general statements, which add little to the work already summarized,[2] are his qualifications about the growth effects of exports and imports. He suggests that for Britain from 1875-1913, export expansion had an adverse effect on growth. The expansion was based mainly on increasing sales to semi-protected Empire markets. This allowed Britain to avoid the technical improvements in her export production methods, which would have been necessary for her to retain her export share in more competitive markets. A slower rate of export growth might have induced Britain to undertake such technical innovations.[3] Similarly, he thinks that removing protection on imports into France in the late nineteenth century would have stimulated growth by providing competition to inefficient domestic producers, whereas tariff protection speeded growth in Germany.[4] Thus,

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[1] Foreign Trade and the National Economy, op.cit., Chapter 12.

[2] Although his classification of the way in which exports can act to the leading sector is useful. See "Lessons from Britain and France", op.cit., pp. 47-51.

[3] Ibid., pp. 54-5.

[4] Ibid., pp. 60-64.

under different circumstances export and import growth can have different effects. Finally, he suggests that export-led growth, as experienced by Britain in the 1850's and 1860's, is similar to the growth described in the Harrod-Domar model.[1] This similarity lies in the importance of demand in Harrod-Domar.[2] He suggests that export expansion will lead to faster Harrod-Domar growth, through greater savings and investments. In fact, this can only occur if investment opportunities raise the savings function, or if there is a Classical savings function in which savings depends on income distribution. Otherwise, an increase in export, in Harrod's terminology, merely raises G above Gw,[3] unless the reallocative gains from trade lower the capital output ratio.

C.W. Hultman has written a survey of exports and economic growth.[4] It consists mainly of brief descriptions of existing work. It is useful in so far as it attempts to show relationships between exports and the Harrod-Domar model, but it consists only of a description of how much the equilibrium growth rate is raised if a country runs a balance of payments deficit and thereby imports capital.

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1 Ibid., p. 47. See also "Lessons from Britain Since 1913", op.cit, where he contrasts Harrod-Domar with the Abromovitz-Solow model (for example, R.M. Solow, "Technical Change and the Aggregate Production Function", Review of Economics and Statistics, August 1957) in terms of their balance of payments implications.

2 See for example, E. Domar "Capital Expansion, Rate of Growth, and Employment", Econometrica, April 1946.

3 See R.F. Harrod, Towards a Dynamic Economics, (London 1948), especially Lecture 4,

4 "Exports and Economic Growth. A Survey", Land Economics, May 1967.

Staffan B. Linder's two famous works on trade and growth, An Essay on Trade and Transformation[1] and Trade and Trade Policy for Development,[2] are in fact a little disappointing for our purposes, although useful in other respects. In the earlier book, Linder distinguishes between "underdeveloped" and " growth" economies. These are polar cases. A "u-country" is characterized by inability to reallocate resources between sectors, due to a lack of entrepreneurship and to economic and cultural barriers to labour mobility. Before trade it is in a low level equilibrium trap.[3] A "g-country" is an advanced country already experiencing economic growth. A u-country can gain from trade by a reallocation of its consumption in the way described by Gottfried Haberler[4] in accordance with the international terms of trade ratio, although factors employed in the imports competing industry must be prepared to suffer a cut in their real rewards, if they are not to be rendered unemployed. If these factors are at a subsistence level before trade (as in the low level equilibrium trap situation), they cannot exist physically in the long run at lower rewards. Thus, the

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1 (Stockholm, 1961).

2 (London, 1967).

3 This situation was described by theorists in the 1950's such as R.R. Nelson in "A Theory of the Low Level Equilibrium Trap", American Economic Review, December 1956. It is the basis of much of the discussion of the vicious circle of poverty. For some criticisms of the theory, see H. Myint, The Economics of the Developing Countries, op.cit., Chapter 7.

4 "Some Problems in the Pure Theory of International Trade", Economic Journal, June 1950, cited by Linder, An Essay on Trade and Transformation", op.cit., p. 24.

losses to the import competing sector must be set against the consumption gains. In the export sector per capita incomes will grow. This stimulates population growth by a Malthusian mechanism. An equilibrium is reached with higher, but constant, per capita income in the export sector, where population and aggregate income grow at the same rate. Linder assumes[1] that aggregate income cannot grow faster than population. As the import competing sector is gradually extinguished,[2] per capita income for the whole economy approaches that of the export sector, the process of population and aggregate income growth goes on indefinitely (international prices being assumed constant), unless there is some third factor, such as land, which is limited in supply, to cause diminishing returns to the labour and capital in export production. Thus, the economy is at a new low level equilibrium, but this equilibrium is above subsistence level. This is little, if anything more than an extension of the static gains from trade analysis, and only one page[3] of his book is devoted to the question of whether trade can initiate a growth process. Linder says in this connection that prolonged periods of higher incomes may help entrepreneurial ability to develop and depress the birth-rate through a "standard of living" effect, but the existence

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[1] Op.cit., p. 30.

[2] If there exists a third sector (an agrarian subsistence sector) part of the process of elimination may be shifted to it. Linder assumes that labour can migrate out of import competing activities into this sector. The capital-labour ratio, and thereby income per head, is then lowered in that sector as a result of migration into it, to below subsistence level.

[3] Ibid., p. 40.

of a limitational factor, such as land, can make the period of higher incomes too short for this to ocfur. As an aside, one may point out that in many South-East Asian countries, such limitations on export expansion did not occur. Growth in g-countries is largely outside the scope of our survey, since we are interested in the initiation and early stages of a growth process. Briefly Linder shows that in a Harrod-Domar model re-allocative gains from trade are compounded over time.[1] Also, the warranted rate of growth might be raised as a result of a fall in the capital output ratio, since a higher real income is obtained through trade from a given capital stock.[2] Linder is somewhat pessimistic about underdeveloped countries developing new exports especially of manufactures, since he feels that comparative advantage develops only in products suiting existing demand conditions.

In Trade and Trade Policy for Development[3] Linder is concerned with poor countries which are already growing (he calls them "developing" countries) and for whom trade is a constraint on growth. They need certain imports of capital goods and imports to maintain and operate

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[1] Income is $Y_t = Y_o e^{rt}$ in a closed economy, where r is the autarky growth rate and t the length of time over which growth has occurred. After-trade reallocative gains (equal to cY) must be added to the initial income, Y. Thus the initial income to be compounded after trade is increased.

[2] Thus the value of r would be altered.

[3] Op.cit.

those goods, which they cannot produce domestically.[1] Since both the growth rate and the current income level is lowered, if these essential imports are not available, different theory and different policy conclusions are necessary from those of neoclassical analysis,[2] at least for their trade relations with rich countries. He does not discuss any dynamic gains from trade for these countries, other than the use of the foreign exchange provided by exports. He does mention that there also exist "backward" (as opposed to "developing") countries, which are the u-countries of his previous book. The discussion is much as before, but he observes that if exports are of a vent for surplus type, then there is less likelihood of losses to the import competing sector, since export earnings can be spent on imports without representing demand diversion.[3] He notes that through the effects of trade on the export sector, that sector eventually can transform the economy, or part of it, into a developing economy. Even so, it is possible that the extinguished import competing sector offered the best growth prospects.[4] The idea of trade as a constraint on growth is examined further in Subsection 3viii on trade policy, where some macro policy models are discussed.

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[1] This is not a comparative cost approach except in the trivial sense that these imports could be produced at home only at infinite costs.

[2] By neoclassical analysis is meant the traditional comparative cost approach elaborated by Heckscher-Ohlin. See Ohlin, Interregional and International Trade, op.cit.

[3] Ibid., p. 145.

[4] Ibid., p. 146.

Kravis has examined the idea that trade was an engine of growth in the nineteenth century, but is not so in the twentieth century.[1] Kravis disputes the dominant role of trade in the nineteenth century, although he provides evidence mainly for the USA only. In the USA exports were not the fastest growing sector, nor the sector which attracted foreign investment. Further, the countries of the "centre" (UK, France, Germany, etc.) were growing more slowly than the "periphery" (USA, Canada, Australia, etc., and countries still considered under-developed such as India). Nor was the "centre's" propensity to import rising fast enough to ensure that its demand for imports was faster than the "periphery's" growth of product. In fact, the USA and others may have benefited from the centre's slow growth to the extent that capital exports and emigration from the UK varied inversely with domestic growth. Growth, Kravis thinks, depended much more on internal conditions, although it was helped by trade. The pessimism in present day less developed countries about export prospects is ill-founded. Their postwar export performance has been good by nineteenth century standards, only their share has declined while postwar world trade has boomed. The failure to expand export shares is to be found primarily in domestic supply conditions, particularly import substitution policies which discourage exports. Deficiencies in rich countries' demands for poor countries' exports is not a dominant factor.

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[1] I.B. Kravis, "Trade as a Handmaiden of Growth: Similarities between the Nineteenth and Twentieth Centuries", Economic Journal, December 1970. He is explicitly examining the views of Ragnar Nurkse, put forward in Equilibrium and Growth in the World Economy (edited by G. Haberler and R.M. Stern), (Cambridge, Mass., 1962).

Huggins and Lim have studied trade and growth in Jamaica and Ceylon, respectively.[1] Huggins describes the impact of the aluminium industry on the Jamaican economy in terms of the proportion of export receipts retained locally. This is a useful first step in assessing export-induced growth and is incorporated in the methods used in the present study, set out in Chapter III. Lim's work is an explicit attempt to test Baldwin's theories of trade and growth.[2] with reference to the tea and rubber industries of Ceylon. Lim also breaks down export receipts into local versus foreign payments, and considers the role of technological externalities and economies of scale.

Vernon surveys the economic effects of export expansion based on foreign investment in less developed countries.[3] It is useful in that it makes explicit the role of foreign enterprises but it mainly surveys work already surveyed here.

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[1] H.D. Huggins, Aluminium in Changing Communities (London 1965), Chapter 5, "The Bauxite-Alumina Enterprises and the Jamaican Economy". Y. Lim's work was originally a doctoral dissertation for the University of California at Los Angeles, (not obtained for this study), and is published as "Impact of the Tea Industry on the Growth of the Ceylonese Economy", Social and Economic Studies, December 1968; and "Trade and Growth: The Case of Ceylon", Economic Development and Cultural Change 2, 1968.

[2] Especially Baldwin's "Export Technology and Development from a Subsistence Level", op.cit.

[3] R. Vernon, "Foreign Owned Enterprise in the Developing Countries", in J.D. Montgomery and A. Smithies (editors), Public Policy (Cambridge, Mass., 1966), reprinted in Theberge, Economics of Trade and Development, op.cit

II - 3v Dualism

Dualism is the coexistence of two sectors in an economy, one of which (the "advanced" sector) is characterised by technologically advanced production methods requiring the use of capital. The other is a "backward" sector using little capital and where labour is in surplus in the sense that some labour could be withdrawn without the sector's output falling. Some models of dualism are set out here briefly, and their relevance to the trade and growth question is then examined.

Some explanations have been given in static terms of the coexistence of two such sectors. The most quoted of these explanations is that of Eckhaus.[1] Eckhaus erects a verbal and geometric model of an economy closed to foreign trade, with two goods and two factors. The model uses the Edgeworth-Bowley box diagram and the transformation frontier device familiar to students of international trade theory.[2] One good (good A) can be produced only with a small number of productive techniques. The production function of good B on the other hand exhibits continuous substitutability between inputs, although production would not be pushed beyond the point where the marginal product of either factor was

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[1] .R.S. Eckhaus, "The Factor Proportions Problem in Underdeveloped Areas", American Economic Review, September 1955, reprinted in A.N. Agarwala and S.P. Singh, (editors), The Economics of Underdevelopment (New York, 1963).

[2] See for example, K. Lancaster, "The Heckscher-Ohlin Trade Model: A Geometric Treatment", Economica, February 1957.

zero. If the production of A requires, say, capital intensive techniques whatever the factor price ratio, then it is possible that there will be a region of the economy's production possibility curve where further specialization on A will cause labour to become unemployed. As wages fall to zero, labour use in the sector producing B will rise until the marginal product of labour in B is zero. Of course society's position on the transformation curve will depend on demand conditions. The greater is the preferences for A, the more likely is unemployment. In these circumstances society faces a conflict between maximising output and maximising employment. It must be stressed that in the Eckhaus model unemployment could be alleviated or even removed by foreign trade,[1] if B can be exported. This would shift the economy's production equilibrium toward greater specialization on B which would increase the demand for labour.[2] To the extent that wages do not fall to zero in practice the likelihood of unemployment is increased.

An alternative explanation of dualism has been given by Mrs. Lutz, with reference to Italy.[3] She attributes dualism to market imperfections. In the early days of development of the country's industrial sector high

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[1] Eckhaus notes this possibility with respect to a simpler model which he presents but not for the present model. See op.cit., p. 363.

[2] However, the fact that foreign trade can provide a solution depends significantly on Eckhaus's assumption of a two factor model. If land is used in the backward sector it may be much more difficult to raise labour marginal productivity in that sector (a necessary condition for increasing production and starting to export) by reallocating large doses of capital from the advanced sector.

[3] V.C. Lutz, "The Growth Process in a 'Dual' Economic System" op.cit.

wages were imposed by trade union pressure. These wages induced the use of capital intensive methods, reducing the offtake of labour from the poorer South. Her position has been attacked by Spaventa,[1] who stresses the importance of oligopoly in the advanced sector, rather than of high wages. Under oligopoly investment is restricted and tends to go towards replacing goods which the backward sector already produces. Oligopoly however is itself a dependent variable, being a creature of technological changes which promote economies of scale (making for industrial concentration) and the use of capital intensive techniques.[2]

The main interest of dualism is whether it persists over time, whether the advanced sector can transmit development to the backward sector. The pathbreaking work here is that of Arthur Lewis.[3] In Lewis's backward sector labour is in surplus, a condition which he

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[1] L. Spaventa, "Dualism in Economic Growth," Banca Nazionale del Lavoro Quarterly Review, December 1959.

[2] Ibid., pp. 429-430.

[3] W.A. Lewis, "Economic Development with Unlimited Supplies of Labour," Manchester School of Economic and Social Studies, May 1954, reprinted in Agarwala and Singh, op.cit. See also his "Unlimited Labour: Further Notes", Manchester School of Economic and Social Studies, January 1958. Lewis's second article is almost entirely an attempt to write his first article explicitly in Classical terms. It adds little to the earlier model.

associates with zero marginal productivity of labour.[1] Since workers share the output in the backward sector, labour will be available to the advanced sector at a wage equal to their average product, plus a differential to take account of higher costs of living in the advanced sector, incentives to move, etc.[2] Capital accumulation in the advanced sector can thus proceed entirely by "widening" (rather than deepening),

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[1] A.K. Sen has shown that zero marginal productivity of labour is neither a necessary nor a sufficient condition for a labour surplus. It is assumed in most models that it is labour hours rather than workers in a literal sense whose marginal product is considered. Thus individual workers are not idle in the backward sector, but all workers lower their input of labour, and share the proceeds of work (together with dependents). If a worker is removed from, say, a family farm, output will only remain constant if the other family members increase their work input to make up for the work done by that worker. If they do not (e.g. if they have a strong marginal disability of work), output will fall even if marginal productivity was zero. If they have a strong desire for extra consumption, they may make up output to its former level even if the departed members' marginal productivity was positive. See Sen's "Peasants and Dualism with or without Surplus Labor" Journal of Political Economy, October 1966.

[2] In fact, as S. Wellisz has shown, if migrant workers can be sent by their families part of the family's subsistence output, the supply price of labour to the advanced sector is thereby lowered. See "Dual Economies, Disguised Unemployment, and the Unlimited Supply of Labour", Economica, February 1968, p. 38.

so that the rate of return on capital does not fall.[1] Whilst labour is available at a constant wage, moreover, all benefits of technical progress accrue to capital. In essence this process continues until the labour surplus is eliminated and labour becomes scarce.[2] Lewis sees the reallocation of national income towards profit receivers which occurs during the process of elimination of the labour surplus as an essential part of the raising of the country for a 4-5% to a 12-15% saver.[3] He regards an increase in the ratio of voluntary saving to national income as essential for development.

A more elaborate attempt to construct a model of development in a dual economy has been made by Fei and Ranis.[4] Like Lewis, they postulate a large backward agricultural sector and a small but growing

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[1] Land is not used as an input in the advanced sector, so Classical diminishing returns do not set in.

[2] In fact Lewis realizes that with a constant output and declining work-force in the backward sector, average product will rise, thus raising wages.

[3] I.e. raising gross domestic saving from 4-5% to 12-15% of GNP.

[4] J.C.H. Fei and G. Ranis, Development of the Labor Surplus Economy, (Homewood, Illinois, 1964). The essentials of the model are set out in Chapter 2, "The Landscape of Development", pp. 7-57, and the basic closed-economy model is modified to include foreign trade in Chapter 8, "Development in the Open Economy" pp. 288-319.

industrial sector. Labour is available from the agricultural sector at an institutionally fixed real wage approximating to the initial average product of labour in agriculture. Investment funds for expansion of industry partly come from capitalists' reinvested profits, as in Lewis, but more importantly from savings made out of the agricultural surplus generated by rising average productivity in agriculture.[1] The economic and institutional mechanisms whereby the owners of the agricultural surplus are induced to save are discussed at some length. The process continues so long as there is an adequate agricultural surplus. Eventually a turning point is reached where the economy graduates into the economic maturity resulting from labour scarcity. Fei and Ranis make a plea for the use of labour intensive techniques in industry[2] to maximize labour reallocation to the industrial sector. As Sen has pointed out, however, labour intensive techniques are likely to result in a lower volume of savings out of profits, since the share of profits is higher with capital intensive techniques.[3] Stress is also placed by Fei and Ranis on attempts to improve agricultural productivity, in order to increase the agricultural surplus. A more

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1 In the model it is assumed that wages are kept down to the initial level, throughout the period of labour surplus, by competition among surplus workers, whose numbers are augmented by population growth. It is not explained how rising average productivity fails to prevent wages rising to a certain extent. See <u>ibid</u>., pp. 257-260.

2 <u>Ibid</u>., p. 43.

3 A.K. Sen, <u>Choice of Techniques. An Aspect of the Theory of Planned Economic Development</u> (Oxford, third edition 1968) pp. xii-xviii.

formal model of dual economic development is given by Jorgensen.[1] In the industrial sector output grows at the same rate as capital stock and labour force in the absence of technological change. Technological change allows capital to grow at a faster rate, thus raising per capita income.[2] Continued progress depends on the continued generation of an agricultural surplus, until the economy eventually is dominated by the advanced sector.[3]

These models of dualistic development have been formulated mainly with large and apparently overpopulated countries in mind. India is the typical example. They are principally models of closed economies, which is consistent with the fact that countries like India have low proportions of foreign trade to national product. To see if the models shed light on the development process in smaller, export orientated economies, such as Malaysia, it is necessary to ask first if the export sector can be the advanced sector of the models. Fei and Ranis are adamant that the traditional export sector, based on the production of primary products, is not an organ of growth.[4] The advanced sector they envisage is one of manufacturing. They feel however that a country with

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[1] D. Jorgensen "The Development of a Dual Economy", Economic Journal June 1961. Jorgensen has also published a survey of theories of dualism, "Testing Alternative Theories of the Development of a Dual Economy", originally published in I. Adelman and E. Thorbecke (editors), The Theory and Design of Economic Development (Baltimore 1967), reprinted in I. Livingstone (editor), Economic Policy for Development (London, 1971).

[2] This is true even if the technical progress is neutral in the sense of leaving the capital-labour ratio untouched for a given set of factor prices. See ibid., p. 327.

[3] Ibid., p. 334.

[4] Because primary products involve low value-added in terms of ingenuity and capital. See op.cit., p. 296.

a small subsistence sector might achieve growth by concentrating entirely on industrial exports.[1] In fact, their views on traditional exports are based on little more than casual impressions. Certain primary exports could have similar propulsive effects to an industrial sector,[2] although this is not inconsistent with the existence of a domestically or export orientated manufacturing industry also taking labour from the subsistence sector. A process of primary export expansion could be seen in terms of the dualistic model, with labour being drawn from a (relatively small) subsistence sector.[3] This is little more than a highly simplified version of models of export growth and economic development presented already in this section.

One important point remains. Development in small export economies such as Malaysia and Ceylon in fact did not occur with the export sector drawing labour from local agricultur. Rubber in Malaya expanded with labour drawn at a relatively constant (low) wage from India.[4] To

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[1] Fei and Ranis, op.cit., p. 302. Concentration on industrial exports alone is not enough for a large labour surplus country, which requires resources to be devoted to raising agricultural productivity.

[2] It will be shown in Chapters IV and VI that tin mining in Malaysia, particularly the gravel pump sector, qualifies as a candidate for this role.

[3] Whether there is surplus labour in a small subsistence sector is an empirical question. It is not impossible in principle if the supply of land is also in short supply. In fact, the existence of truly surplus labour anywhere has been questioned by a wide range of empirical evidence. See Wellisz, op.cit., pp. 44-51 and Jorgensen, "Testing Alternative Theories of the Development of Dual Economy", op.cit., pp. 68-80.

[4] The possibility of capitalists importing cheap immigrant labour to forestal a fall in the rate of profit is noted by Lewis, "Economic Development with Unlimited Supplies of Labour," op.cit., p. 436.

this extent a form of dualistic model is relevant, with India as the subsistence sector. Whether the industry's expansion could have been achieved using local Malay labour at a much higher wage is difficult to establish.[1] The tin industry similarly was developed with immigrant labour, from China. Local (Malay) participation in rubber took the form of direct entry into the industry as entrepreneurs (smallholders). After the Second World War when export expansion occurred without immigration, offtake from local agriculture did occur in Malaysia.[2]

Apart from the question of the effects of immigration, dualistic theories offer little additional understanding of the process of growth through trade. This is not to say, however, that problems of dualism do not exist in countries like Malaysia, particularly dualism of the newer sort recently described by Professor Singer.[3]

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[1] One argument against would be that Malays would not respond to economic incentives. This is the sort of case suggested by the Dutch economist Boeke, whose views are summarised (and criticized) by B. Higgins in "The Dualistic Theory of Underdeveloped Areas", Economic Development and Cultural Change, 1956. The present study disagrees with Boeke's view. See Subsection V - 1i.

[2] It will be shown in Chapters IV and V that about half the tin dredging labour force is Malay, as is a quarter of the labour force on rubber estates.

[3] H.W. Singer, "Dualism Revisited: A New Approach to the Problems of the Dual Society in Developing Countries," Journal of Development Studies, October 1970. Singer redefines dualism in terms of employed versus unemployed, many of the latter being in urban centres. The wage earners today he says are an elite, when typically high levels of structural unemployment prevail (as in West Malaysia at present). He hopes for a solution through the development of new technologies using labour intensive methods.

II - 3vi Macro Models

Since the early 1960's several attempts have been made to formulate empirically testable theories of trade and growth in aggregate terms for poor countries.[1] One of the most interesting of these attempts is that of Maizels, produced for the National Institute of Economics and Social Research, London.[2] Maizels' study uses a model originally formulated by Chenery and his associates[3] applied to the countries of the Overseas Sterling Area. The model is of a simple Keynesian variety where

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[1] It is worth noting briefly that some work has been done on this topic for advanced countries too. A. Lamfalussy in The United Kingdom and the Six. An Essay on Economic Growth in Western Europe (London 1963) has put forward a theory whereby rapid export growth, by redistributing income to profits, raises both the savings and investment ratios of a country. W. Beckerman, in "Projecting Europe's Growth", Economic Journal December 1962 has produced a demand-orientated model where export growth induces investment (and business saving) and thereby raises productivity which reinforces competitive advantage in the world market. So long as wages do not rise faster than labour productivity a virtuous circle is induced of fast growth unhampered by any balance of payments constraint. R.M. Stern, in Foreign Trade and Economic Growth in Italy (New York, 1967) concludes the rapid Italian growth from 1950-63 which had been based on export expansion, was checked by wages rising faster than labour productivity. These wages rises raised the demand for domestic goods and imports.

[2] A. Maizels, assisted by L.F. Campbell-Boross and P.B.W. Rayment, Exports and Economic Growth of Developing Countries. A Theoretical and Empirical Study of the Relationships between Exports and Economic Growth, with Illustrative Projections for 1975 for the Main Overseas Sterling Countries, (London, 1968).

[3] H.B. Chenery and M. Bruno "Development Alternatives in an Open Economy. The Case of Israel," Economic Journal, March 1962, reprinted in J. Bhagwati and R. Eckhaus (editors), Foreign Aid (London 1970); and H.B. Chenery and A.M. Strout, "Foreign Assistance and Economic Development", American Economic Review, September 1966. These two articles are discussed further in Subsection 3vii on trade policy.

(1) $Y + M \equiv C + I + X$

(2) $C + S \equiv Y$

(3) $I \equiv S + F$

(4) $X + F \equiv M$

and combining (1) and (2) gives

(4a) $I - S \equiv M - X$,

where Y, C, S, I, X, M and F are gross national product, consumption, gross domestic savings, gross domestic investment, exports of goods and services, imports of goods and services and net inflow of foreign capital, respectively.[1] Treating the ex post identity (4a) as an equilibrium condition, the process of adjustment is described whereby I, S, M and X fulfill condition (4a). I - S represents the saving gap and M - X the trade gap. Three major constraints on economic growth in less developed countries are identified:- the availability of human skills, the limit set on investment by the supply of domestic savings supplemented by the net capital inflow from abroad, and the limit set on imports and net borrowing from abroad.[2] The first of these constraints is not considered in the Maizels model. For any planned target growth in real output the saving gap is generated by the difference between investment requirements related to output by an incremental capital-output ratio, and an ex ante savings function. With an exogenously determined growth rate of exports, the trade gap is generated by the difference between exports and the 'minimum' level of imports essential for the planned growth rate. The 'minimum'

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[1] Maizels, op.cit., pp. 51-52.

[2] Ibid., pp. 53-54.

imports are those of capital goods assumed to be essential if fixed domestic capital formation is to occur. Thus, crudely, imports depend on export earnings while investment depends both on domestic savings and imports (of capital goods).[1] The underlying hypothesis is that the capacity to export is the key constraint, while savings act as a residual adjusting to the difference between investments and net capital inflow.[2] There will be some equilibrium growth rate when condition (4a) is fulfilled. If at that rate $I > S$, there will have to be net foreign borrowing. If the planned growth rate is above this equilibrium rate, net foreign borrowing in excess of the *ex ante* trade gap is necessary in order to raise imports above the minimum level consistent with the planned growth rate. Here growth is constrained by saving. Where $(I - S) < (M - X)$ *ex ante*, it is the trade gap which is the effective constraint and net foreign borrowing is necessary to bridge the difference. There may also be relationships between the trade gap and the savings gap. In particular, domestic savings may depend on export earnings especially, as Maizels notes, in countries like Malaysia and Ceylon where much government revenue comes from export taxes.[3] The hypothesis that savings depend significantly on exports has recently been tested more thoroughly (for 28 countries for 15 years) by J.K. Lee. Lee finds that the relationship holds for most of his cases, except in

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[1] *Ibid.*, p. 84.

[2] *Ibid.*, p. 96.

[3] *Ibid.*, p. 58.

particular for Israel, Greece and Korea, which are all countries to which the Chenery et al 'two gap' analysis has been applied.[1]

Maizels quantifies several of the main relationships. For eight less developed and four advanced countries he calculates the gross incremental capital-output ratio,[2] the fit of the regression equations in all cases being very good.[3] Second, calculation of the elasticity of domestic fixed investment with respect to capacity to import yielded results in most cases slightly below 1.0, again with good fits. Finally, regressions of savings on gross domestic product, exports, and non-export GDP were run. The fit was found to be improved considerably by adding exports to GDP. As a check on his results Maizels takes three key relationships - the ICOR, the investment elasticity, and the initial proportion of GDP invested in fixed assets - and uses them to calculate *ex post* what the growth rate would have been for a number of countries during the 1950's, given their respective capacities to import. For all the less developed countries in the sample the actual rate was slightly above the computed rate. This is attributed partly to data shortcoming and partly to short term influences of the balance of payments excluded from the model.[4] The rest of the work projects the future growth of exports of the various Overseas Sterling Area countries, on from this export growth the likely future growth of output to 1975 is projected.

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[1] See "Exports and the Propensity to Save in Less Developed Countries", *Economic Journal*, June 1971.

[2] This varies from about 3 to 5 in less developed and 4 to 6.5 in advanced countries. An ICOR is not calculated for Malaysia, but for projection work Maizels assumes Malaysia's ICOR to be 3.5 See *ibid.*, p. 236.

[3] Only two have an R^2 below 0.9 and none below 0.8

[4] *Ibid.*, pp. 97-98.

Haring has produced a rather different macro model of trade and growth.[1] The model consists of seven equations which relate exports to foreign income, consumption to past consumption and current income, fixed investment to profits, residential construction to per capita income, inventory investment to imports and past income, and employment to income and initial capital stock. Investment consists of fixed investment, residential construction, and inventory investment. The model is concluded with the usual identity of $Y = C + I + G + X - M$, the letters standing for the familiar economic quantities. The model is tested against the experience of Japan, Puerto Rico, Hong Kong, Jamaica and the USA. The first four all have experienced rapid growth in exports and output, and Haring tries to see whether they have any structural similarities in terms of the macro relationship outlined. The USA is included for comparison. On the basis of his results Haring decides that their key relationship lies in the response of domestic supply to foreign demand. Japan and Puerto Rico are "successful" examples of export industrialism, in spite of apparently different economic structure, because their investment (in export industries) is highly responsive to profits (earned in export industries). Manufacturing exports have generated greater spillovers (not directly quantified in the model) to the rest of the economy in Japan and Puerto Rico than have primary products in Jamaica. Hong Kong's statistics are poor, apparently, and results inconclusive. Haring does not spell out in what respect Jamaican development is not "successful" (e.g. in terms of raising per

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[1] J.E. Haring, "Export Industrialism and Economic Growth: A Dynamic Model", Western Economic Journal, 1962.

capita output) in relation to Puerto Rico or Japan.

Without specifying a new model of the Maizels or Haring variety, Pierre Crosson has produced an interesting short study of trade and growth in Malaysia.[1] Exports can promote growth says Crosson by improving overall factor productivity, by providing multiplier-accelerator effects to the rest of the economy, and by generating savings. The first effect is outside his scope in the time available for the study. He tests the multiplier-accelerator effects by regressing (in simple linear form) time series of annual changes in export income on annual changes in non-export GNP for the years 1955-1962. The relation between the two is not statistically significant from zero. The accelerator effect is weak he says because the export industries generate few inter-industry linkages.[2] He does not appear to consider the accelerator effects of industries producing for the final demand purchaser of export industry factors of production. The multiplier is close to 1. The marginal propensity to save and to make foreign payments out of changes in export income is 0.81, while the marginal propensity to save out of export income is 0.63,[3] the fit of the regression equations being good and the results statistically significant. If in addition the marginal propensity to import is 0.2, there is

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[1] P.R. Crosson, "Exports and Economic Growth: Malay A Case Study", mimeographed working paper produced for National Planning Association, Washington D.C., 1964. Crosson's reason for undertaking the study is that he wishes to see whether export projections can be used to project aggregate growth.

[2] This will be shown in Chapters IV and V to be true of rubber but not of tin.

[3] _Ibid._, p. 18.

there is virtually no change in domestic consumption resulting from a change in exports.[1] The high propensity to save is attributed to the fact that profits bear the brunt of price changes of export goods.[2] The high marginal propensity to save out of export income, itself an economically significant result, is also explainable in terms of marginal export taxation by the government.

R.F. Emery has made a statistical analysis of trade and growth.[3] On the basis of linear regression equations of per capita income growth on (deflated) export growth for fifty countries for 1953-63, he finds that a 2½% rise in export earnings is associated with a 1% rise in GNP. He realises that causation may not be entirely one way from exports to growth, but suggests that his results are at least tentative evidence for the growth through trade hypothesis.

II - 3vii Trade Policy for Development

The role of trade policy in overall development planning has been examined in several macro policy models. The most interesting is that

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[1] Ibid., p. 20.

[2] This proposition is examined further in Chapter VII, which discusses final demand linkages. It is possible that with the introduction of a lagged relationship between export earnings and wages, a much lower marginal propensity to save could be achieved. In any case, Crosson's estimates of savings are suspect. Saving is calculated as a residual between domestic investment and net capital inflow. Net capital inflow may be incorrectly estimated to the extent that there is a large 'errors and omissions' component in the Malaysian balance of payments.

[3] "The Relation of Exports and Economic Growth", Kyklos, 2, 1967.

of Chenery and Bruno,[1] elaborated by Chenery and Strout.[2] Their work centres on the so-called "two-gap" analysis which was introduced in the previous subsection. Chenery and Bruno construct a planning model, to be applied to Israel, with equations giving equilibrium conditions for labour, capital and foreign exchange.[3] The capital equation corresponds to the Harrod-Domar warranted rate of growth,[4] although the capital-output ratio can change over time in response both to technical change and changes in output composition.[5] The main aim of the model is to identify in advance the factors likely to constrain growth. As shown in the previous subsection these include the ability to invest, which is described in terms of labour skills, managerial ability, etc. and can increase over time as a result of learning by doing.[6]

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1 "Development Alternatives in an Open Economy: The Case of Israel", op.cit.

2 "Foreign Assistance and Economic Development", op.cit. See also "Comments" on the Chenery-Strout model by J.C.H. Fei and G. Ranis, and H.J. Bruton in American Economic Review, September 1968 and June 1969, respectively, with "Replies" by Chenery and Strout and by Chenery in the respective issues.

3 Op.cit., pp. 122-123.

4 Ibid., p. 123.

5 Ibid., pp. 118-119.

6 It is in effect a sophisticated version of Harrod's "natural" rate of growth. See R.F. Harrod, Towards a Dynamic Economics, op.cit., p. 87.

The other constraints are the supply of domestic saving and of foreign exchange. The model is set out in programming form to find the set of development programmes which will satisfy the basic equations of the model and fall within predetermined limits of a number of listed controlled variables.[1] With various values of controlled and exogeneous variables, each in turn of the ability-to-invest, savings, exports, and foreign borrowing limits may become the operative constraint. The model is supplemented by interindustry analysis to determine what the effects of policies are on individual sectors. For example, certain policies may require large resource shifts unlikely to be possible in practice.[2] Results can then be used to modify parameters in the aggregate model. A maximum possible rate of growth can be indicated by this programming procedure. However, it is possible that if this rate involved foreign borrowing to the maximum possible amount, society would choose a lower rate, since there is likely to be a trade-off between the productivity of borrowing,[3] and the cost in terms of interest payments and future consumption.

In the Chenery-Strout version, stress is laid on the distinction between the short run (5-10 years) where structural rigidities exist, and the long run where judicious policies can remove rigidities. In

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[1] Controlled variables include the exchange rate, expected labour productivity, growth, the level of employment, maximum available foreign borrowing, and the marginal propensity to save.

[2] Chenery and Bruno, op.cit., p. 113.

[3] Once the ability to invest constraint had been reached, further capital inflows would raise consumption but not GNP (ibid., p. 136.) Up to that point productivity will be higher to the extent that it is the foreign exchange not the savings constraint which is operative.

the short run exports, import requirements, the savings propensity and the ability to invest are essentially exogenously determined. External assistance can be used to raise actual investment to the level permitted by the "ability to invest" (skills, managerial ability, etc.) by switching domestic consumption expenditure on to imports. Such a saving gap could occur even in the absence of a balance of payments deficit. Also, of course, aid can be used to relieve a balance of payments deficit which is constraining growth. In the long run domestic policies must switch resources to export industries and import substituting activities,[1] aided possibly by suitable changes in the exchange rate.[2] Savings (including savings raised by taxation) must also be raised.[3] Chenery and Strout see a country passing through a series of stages, though not necessarily in a given order. In Stage 1, investment should be raised rapidly towards the "ability to invest" ceiling, using foreign aid as necessary. During this period some attempt should be made to raise savings and taxes. After about a decade the country should attempt to transfer its economic structure so as to sustain some target rate of growth (say 6% to 7%) without external aid. To this end it promotes import substitution. Import substitution may be enough to prevent imports rising as a percentage of GNP, but export growth equal to at least the target growth rate of GNP is likely to be necessary to

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[1] Chenery and his associates realize that import substitution may involve a lowering of investment productivity, which may make necessary an alteration in the assumed parameters of the planning model. See Chenery and Bruno, op.cit., p. 135.

[2] A situation where a large import surplus is financed by external aid is one where the exchange rate is likely to be over-valued, which in turn discourages exports and import substitution.

[3] In a situation not characterised by structural rigidities, a rise in savings should be sufficient in itself to transform domestic resources into exports. See H.J. Bruton, "Comment", op.cit., p. 440.

prevent a balance of payments deficit from arising. Stages 1 and 2 see the effective constraint on growth (up to the rate allowed by the 'ability to invest') as the supply of domestic savings. A country may also enter a Stage 3, where the balance of payments is the binding constraint. In particular the country needs a certain minimum level of imports (e.g. of spares and raw materials, as well as capital goods) to maintain GNP growth and investment. Here again structural readjustment is necessary. It is not clear whether Chenery and Strout expect that countries will normally enter Stage 3, or whether the necessary structural adjustments will occur in Stage 2.

As a test of their theory, Chenery and Strout study for fifty less developed countries the possibilities of the transition from rapid growth based on external assistance to target growth self-financed. Countries are awarded prizes according to whether they fulfill three criteria. The investment criterion is that in Stage 1 the rate of investment growth must be greater than the target rate, and thereafter adequate to sustain the target rate. The latter condition requires the proportion of GNP invested to be greater than or equal to the incremental capital-output ratio multiplied by the rate of investment growth. The savings criterion requires the marginal savings rate to be above the target investment rate; unless the average savings rate is already above that level. The trade criterion requires either export growth to exceed target GNP growth, or the marginal import ratio to be substantially less than the initial average ratio.[1] With target trowth taken to be 5% per year for the period 1957-62, ten countries, including Malaya, meet all

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[1] Chenery and Strout, op.cit., p. 705.

three criteria.[1 2] Korea and Burma meet the trade and savings criteria but not the investment criterion.[3] Chenery and Strout feel that one of the most suggestive features of these results is that almost all the countries meeting the criteria have had rapid export growth rates, while those with unsatisfactory performance have low export growth rates.[4] However, Fei and Ranis have attacked the empirical testing on the grounds that the wrong parameters are being tested.[5] For example in Stage 1 the actual observable imports are greater than the needed imports, yet it is the former which are measured but the latter which are relevant.

Hornby has constructed a model of growth in a dual economy illustrating a possible role of trade policy.[6] The State-owned industrial

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[1] Israel, Jordon, Malaya, Pakistan, Panama, Peru, Phillipines, Taiwan, Thailand, and Trinidad-Tobago.

[2] In Malaya with an ICOR (with output lagged one year behind investment) of 2.33, the ratio of investment to GNP needed for 5% growth is 11.6% compared to an actual proportion of 18% and a growth in investment of 18% per year. The average savings rate (22% of GNP) is already above this, while the marginal propensity to save is 0.26. The export growth rate (5.9%) is above the target growth rate of GNP. See ibid., pp. 708-709. With these values of the parameters, it would seem that Malaya could face only a balance of payments constraint, not a savings constraint, and then only if imports rose very rapidly during a development programme.

[3] Ibid., pp. 708-709.

[4] Ibid., p. 170.

[5] "Comment", op.cit., pp. 908-909.

[6] J.M. Hornby, "Investment and Trade Policy in a Dual Economy", Economic Journal, March 1968.

sector wishing to maximize the rate of growth of capital stock, must employ workers who are paid in food from the agricultural sector. It is assumed that the required agricultural surplus cannot be secured by compulsory confiscation and that the agricultural sector cannot be taxed. Thus food can be had only in exchange for industrial consumer goods, in whose production the government acts as a monopolist, and uses the profits for investment in capital good production. The vital parameter is the elasticity of the agricultural sector's offer curve of food for industrial goods. If this is low, the government can keep industrial consumer food prices high, and production low. Importing food, even against the dictates of static comparative advantage, allows consumer good prices to be raised yet further, thereby raising capital formation. Once food is imported, the price of consumer goods is no longer constrained by the need to secure a sufficient domestic agricultural surplus.

Trade policy can also be couched in less aggregative terms. Investment in individual export industries can be evaluated in the same way as investment in any other project.[1] An internal rate of return, or a net present value, can be calculated using, where necessary, shadow prices for labour, foreign exchange and other especially abundant or scarce inputs. Output can be valued, if desired, according to the extent it earns foreign exchange and/or the extent to which the income will accrue to recipients (e.g. profit receivers) with high savings

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[1] For a discussion of investment criteria in an open economy see H.B. Chenery, "Comparative Advantage and Development Policy", American Economic Review, March 1961, reprinted in Theberge (editor) Economics of Trade and Development, op.cit. For a comprehensive study of investment appraisal see I.M.D. Little and J. Mirrless, Manual of Industrial Project Analysis in Developing Countries (in two volumes) (Paris, 1968 and 1969).

propensities. If investment in an export industry (or any other industry) gives rise to linkages which cause increases in investment (and saving) elsewhere, the expected net revenues from the linked industries could be added to the net revenue stream of the original industry.[1] This is a partial equilibrium approach. In a general equilibrium model shadow prices would be determined within the system simultaneously with the composition (and the total rise) of investment.

It is important to ask how the macro and micro approaches relate to each other in the context of trade policy. First, some of the parameters of the macro model will assume micro-economic optimization. Thus the incremental capital-output ratio will assume that certain choices of investment project have been made.[2] Similarly, other parameters in the macro model can be affected by micro economic policy decisions. For instance, in a Malaysian context a choice to expand tin dredging rather than rubber estate cultivation would (through the greater labour training effects of dredging) improve labour skills and thereby in the long run increase the "ability to invest".[3] With regard to import substitution as a means of removing the trade constraint in the Chenery-Bruno-Strout model a conflict appears to arise between the productivity of investment (in import substitution) and the needs of the

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[1] Technological externalities however would be more difficult to include directly into the analysis.

[2] This is not to say that the aim is to minimize the ICOR. That would imply that capital is the only input with a social cost.

[3] For a discussion of technological externalities in Malaysia see Chapter VI. In the short run, an expansion of dredging might make the skills constraint more acutely felt in the rest of the economy.

model. This conflict is more apparent than real, in that there is a choice between export expansion and import substitution, the choice to be made on grounds of economic efficiency.[1] A more serious conflict arises with regard to the productivity of aid-financed projects (as opposed to programmes). Here a high project profitability can be at the expense of measures to reduce future aid dependence.[2]

The relation of these approaches to two other policy controversies - balanced versus unbalanced growth and industrialization through import substitution - are worth discussing briefly. The balanced growth controversy cannot be dealt with at length here, and in any case in the 1970's it appears somewhat sterile.[3] Exports as a leading sector (an unbalanced-growth argument) involves a question of the allocation of investment resources, a question of whether one growth sequence raises savings and investment via linkages more than another. The danger that prices of products produced by an expanding sector may fall (and thereby lower investment productivity), as envisaged by balanced growth theorists, is less likely to arise if the expanding sector exports its output.[4]

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[1] See Chenery's "Reply" to Bruton, op.cit., pp. 448-449.

[2] Chenery and Strout, op.cit., p. 727.

[3] In the present writer's opinion much of the controversy boils down to an empirical judgement of whether in particular cases potential savers and investors are likely to respond to opportunities provided by linkages. A convenient presentation of the unbalanced growth doctrine, and a summary of the balanced growth case is given in Hirschman, Strategy of Economic Development, op.cit., especially Chapter 3.

[4] See J. Sheahan, "International Specialization and the Concept of Balanced Growth", Quarterly Journal of Economics, May 1958, especially pp. 191-193.

Industrialization via import substitution has been examined in seven case studies commissioned by the Organization for Economic Cooperation and Development.[1] In the countries studied import substitution has been the typical means of promoting industrialization. This, the authors feel, has made for substantial losses in terms of economic efficiency. Excessively capital-intensive methods, induced by an over-valued exchange rate,[2] and imported Western technology, are out of line with domestic factor endowment. Decision making in industry depends more on political and administrative factors than on economic criteria. Indeed in some cases, notably India, industry has actually located itself near administrative centres for this reason. After a period of about fifteen years, a country runs out of easy import substituting investment opportunities. Thereafter it must export manufactures if industrial output is to rise faster than domestic demand. Yet its whole economic structure - of high-cost firms and an over-valued exchange rate - discourages exporting. Little and his associates are skeptical about raising savings by redistributing income to industrialists. Savings can be raised from a wider section of the population by issuing safe and high interest government securities (as in Mexico and Taiwan). Redistribution of income away from agriculture (e.g. by altering the internal terms of trade in favour of manufactured goods) tends to lower the agricultural surplus.

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[1] Argentina, Brazil, Mexico, India, Pakistan, the Phillipines and Taiwan are the countries studied. See the summary volume by I.M.D. Little, T. Scitovsky, and M.F. Scott, Industry and Trade in Some Developing Countries. A Comparative Study (Paris, 1970).

[2] An over-valued exchange rate is itself induced by restrictions on imports. It allows capital goods to be imported relatively cheaply, and makes exports relatively expensive in world markets.

Little and associates feel strongly that promotion of industry should be done in ways other than by protection. To the extent that an industry creates externalities it can be rewarded by the government. Where the shadow wage is below the actual wage, labour use can be subsidized. The exchange rate can be lowered to help exports. The chances of increasing manufactures exports are felt to be good as less developed countries' shares in the world market for manufactures are small. If tariffs are required for revenue purposes, they should be matched by internal excise duties. Essentially what Little is proposing is a set of policy measures designed to promote a pattern of investment based on the sort of social cost-benefit analysis already reviewed in this subsection.

Hirschman has examined the reasons for pessimism about import-substituting industrialization (ISI) in Latin America.[1] He concludes there is greater scope for further industrialization than is often realized, and that ISI based on backward linkages would be not far out of line with comparative advantage. Backward linkage industries would produce intermediate goods for the range of import substituting consumer good industries already established.

Finally, there is the important question of rich countries' policies towards poor countries' exports, an issue raised in the two United Nations Conferences on Trade and Development (UNCTAD) at Geneva in 1964 and New Delhi in 1968, respectively.[2] At present imports of many

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1 A.O. Hirschman, "The Political Economy of Import Substitution Industrialization in Latin America", Quarterly Journal of Economics, February 1968.

2 For a thorough discussion of the two conferences see H.G. Johnson, Economic Policies Towards Less Developed Countries, op.cit.; and H.G. Johnson (editor), Trade Strategy for Rich and Poor Nations, (London 1971).

manufactured goods into rich countries are subject to high effective rates of protection.[1] Certain primary products, such as sugar, where poor countries' production competes with that of rich countries, are also subject to restrictions. Other primary products are subject to high revenue-raising excise taxes (such as the tax on coffee in West Germany). UNCTAD I called for three main types of policy changes: international commodity agreements to stabilize (and raise ?) primary product prices,[2] preferential access to developed countries markets for manufactured goods,[3] and for customs unions and similar preferential arrangements between less developed countries. Little progress has been made in these directions[4] since the first UNCTAD.

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[1] The effective rate of protection is higher than the nominal tariff to the extent that inputs for the goods in question can be imported duty free (or at a lower tariff). For instance, a good selling at $10 at world prices might comprise $5 value-added and $5 materials. If a 100% ad valorem tariff is imposed on the finished good, but materials are imported duty free, the domestic cost of production in terms of value added could be as high as $15, three times the (value-added) production cost of the exporter. See Johnson, Economic Policies, op.cit., pp. 96-99.

[2] One might note in this context that research by A. MacBean has indicated that most underdeveloped countries have not been seriously hampered in their economic development by even severe fluctuations in export proceeds. See his Export Instability and Economic Development, (Cambridge, Mass., 1966), especially Chapter 4, and "Export Instability and Economic Growth", reprinted in Theberge, Economics of Trade and Development, op.cit.

[3] For some critical comments on such preferential arrangements see G.M. Meier, "Free Trade and Development Economics", in J.N. Wolfe (editor), Value, Capital, and Growth. Papers in Honour of Sir John Hicks, (Edinburgh, 1968).
Meier sees them as an 'internationalizing of protection' (p. 408), and prefers a regime of complete free trade in manufactures (p. 411).

[3] See Johnson Trade Strategy, op.cit., pp. 15-20, for comments on the failure of UNCTAD II.

CHAPTER III

METHODS OF ANALYSIS OF THE ECONOMIC EFFECTS OF EXPORT GROWTH

This chapter sets out the analytical approach to be used in the rest of the study.

Section III - 1 Analysis of Export Industry Income Flows

In the analyses of tin and rubber, in Chapters IV and V respectively, attention is concentrated on the disposition of income flows within and from the export sector. The flows consist of payments made for current inputs out of current income, and of capital expenditures.

III - 1i Purchases of Current Inputs

The first and most important step is to split these purchases into their component parts. This is done with three main aims: a) to assemble the necessary data in a convenient form; b) to distinguish foreign from local payments; c) to show what linkages are of sufficient quantitative importance to merit further study.

Within both the tin and rubber industries several sectors can be identified, each with a quite different payments structure. In

tin there is the dredging sector, operated by European[1] firms, and the Chinese gravel pump mining sector. Study of these two sectors provides a contrast between the effects of local and foreign owned export industries. In rubber there is an estate sector, largely but not entirely owned and operated by Europeans, and a smallholding sector, including smallholdings on government land development schemes. The analytical approach set out below is suitable only for estates. There are few intermediate purchases made out of rubber income and little hired labour on smallholdings. Hence the only relevant question at this stage[2] is how much income accrues to the smallholder. This depends largely on institutional and social factors such as land tenancy arrangements, indebtedness etc., for which quantitative information is not available. Existing studies of smallholder incomes, and income on land development schemes, are discussed in Chapter V, Section 1. For each of these sectors, data are set out in time series form, starting with statistics of the gross value of output. As far as possible the series start from when the product first became important as an export. Statistics of the value of purchases are assembled, input by input, full descriptions being given of the methodology used in each case. Normally it will be possible for most years to get employment and wage figures

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[1] A "European" firm in this study is one founded by Europeans and usually with European predominance on the board of directors. It is neither necessarily a subsidiary of an overseas firm nor is its present share ownership necessarily predominantly European.

[2] At a later stage it is necessary to ask how income received is spent, e.g. on local goods or imports.

from which the total wage bill can be calculated. Qualitative information on the kinds of material inputs used it easily obtained. Quantities used are obtainable in many cases and unit values are often obtainable from other sources, including trade returns if the input is imported. To the extent that complete information on inputs is available a full account of purchases can be built up, item by item, and gross profits calculated as a residual. This residual can still be split further into tax and export duty payments, and profit.

The distinction between foreign and local payments is important, especially when the export firms are themselves foreign. Imports of materials are usually easy to identify. Wages paid to local people are treated as a local payment in the first instance, although some part of these wages may be remitted abroad.[1] Wages paid to expatriates are treated as a foreign payment. Gross profits can be split into retained profits, dividends paid domestically, dividends remitted abroad and taxes paid locally and to foreign governments. For public limited companies information is available from annual reports on profits, tax payments, and dividends. These data on profits provide a useful check on the gross profits already calculated as a residual. Dividend payment must be split between local and foreign recipients, the proportion of shares held by Malaysians being a measure of this split. Export duty payments are given for all years in government statistics.

In addition, multiple regression analysis is used in Chapter IV to compare production functions in the two sectors of the tin industry.

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[1] To India for example, in the case of rubber estate workers.

This provides an alternative measure of factor shares as a check on the methods already used.

III - 1ii Capital Expenditure

Data on investment purchases can be assembled in principle in a similar fashion to that for current purchases. In practice data are sparse and much field work is necessary. In most cases only data for the present day are available, and comparisons with earlier dates, in an attempt to show changes over time, have to be qualitative. The breakdown of purchases into labour and materials (and equipment), and into local and foreign payments, remains important.

Section III - 2 Effects of Export Growth on Domestic Factor Supply

In Chapter II the effects of trade on growth were presented primarily as a theory of capital formation, combined with technological externalities in the form of improvements in labour skills and the introduction of new technology. Thus the theory essentially describes export expansion as a means of improving factor supply, and in such a way as to raise per capita income.

Much of the information required to assess these effects will have been already collected under the Section 1 approach. However, the Section 1 data, *per se* tells little about the export industries' effects on development, except to show approximately how much of their current income and investment purchases flow abroad immediately with no domestic multiplier-accelerator effects.[1] Some interpretation (and some additional data) is necessary, therefore.

III - 2i Conceptual Problems

Before methods of approach can be set out there are certain conceptual problems to be dealt with. The question of whether investment in export industries constitutes new capital formation or merely a reallocation of existing investment resources has been discussed in Chapter II. The treatment of immigrant labour, an increase in factor

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[1] Two studies which concentrate on the split between local and foreign payments are H.D. Huggins, *Aluminium in Changing Communities*, *op.cit.*, and Y. Lim "Trade and Growth. The Case of Ceylon", *op.cit.*, and "Impact of the Tea Industry on the Growth of the Ceylonese economy", *op.cit.*

supply induced by export industries and particularly important in Malaysian development, requires some elaboration. Clearly a rise in working population, due to the use of immigrant labour in an export industry and unaccompanied by falls in output elsewhere, gives rise to an increase in national product. This represents "extensive" growth[1] but not necessarily rising per capita incomes. Population growth, however, has accompanied most sustained rises in levels of income per head, as Simon Kuznets' research has shown.[2] While population growth is clearly not a sufficient condition of economic progress, the market opportunities it creates for economies of scale can be an aid to any growth already occurring. On the other hand a highly elastic supply of labour from what amount to overseas subsistence sectors (i.e. India and China) could be a means of keeping low the local return to labour. Another important problem in connection with immigration into Malaysia is that of when the immigrant communities of Indians and Chinese should be regarded as permanently resident local people. In the early days of tin and rubber there were high turnover rates among immigrants. Workers came without their wives and families and often returned home once they had acquired a certain amount of cash. One criterion of permanent settlement is the number of women per 1,000 men. This rose from 592 in 1911, to 891 in 1947, to 937 in 1957.[3] From 1953 an Immigration

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[1] See Chapter II, Section 2 for a discussion of "extensive" versus "intensive" growth.

[2] Modern Economic Growth, op.cit., especially pp. 34-85.

[3] See Lim Chong Yah, Economic Development of Modern Malaya, (Kuala Lumpur 1967), p. 189.

Ordinance came into force forbidding immigration except in special circumstances.[1] In the case of the Chinese, the 1949 revolution in China made return difficult. Thus, both the changes in the female:male ratio and the restrictions on immigration suggest that from the start of the 1950's the Chinese and Indian population should be considered "local".

Second, there is the meaning and significance to be attached to linkages generated by an export industry. In what sense is an export industry with a high proportion of intermediate to primary inputs, or a high proportion of intermediate to final sales, or both[2] likely to lead to more economic growth than an industry without these attributes ? In the case of an export industry set up with local capital the total amount of domestic capital formation will depend on the industry's capital-output ratio. For two industries of equal gross annual value of sales, the degree of vertical disintergration in each (i.e. the extent of linkages) will not determine their relative effects on development, except in so far as it is associated with differences in their overall capital-output ratios. Of course, the possibility of vertical disintegration allows an industry to be established with a smaller initial capital, assuming that the intermediate input required can be imported. Further investment can take the form of substituting domestic

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[1] Ibid., pp. 189-190. Immigration had been subject to various restrictions in the 1930's also.

[2] In Hirschman's account of linkages, although the discussion covers purchases and sales of investment goods as well as current goods, his input-output measure is entirely with respect to current items. See op.cit., pp. 98-119. Conceptually his measure could be extended to an input-output table in which the usual single column vector of investment purchases, (as found in the tables for West Malaysia for example) were disaggregated over each industry, and where each industry, i, sold investment goods as well as current inputs to each industry.

production for imports, in so far as comparative cost considerations allow.[1]

For an industry financed with foreign capital, linkages determine the extent to which domestic production can be developed to supply the industry, or be supplied by it. However, there is no *a priori* reason why domestic investment induced by linkages should be more desirable from the viewpoint of promoting development than direct domestic investment in the main industry itself, except in so far as linked industries introduce different technology in a situation where the export industry's production function differs little from that in established domestic activities.

III - 2ii Methods of Analysing Domestic Factor Supply Changes

The methods outlined in Section 1 identify the intermediate and investment purchases of each export industry. The next task is to analyse the industries producing these inputs as well as identifying and quantifying forward linkages and direct domestic participation in exports. Labour skills and technology will be left until later. At this stage it is capital formation which is important. Probably the best measure

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[1] See A.O. Hirschman, *op.cit.*, p. 101.

of capital is as an annual flow of services, to be identified approximately with the non-wage component of value added.[1] A capital-output measure can be taken therefore as the proportion of non-wage value-added in the gross annual value of output. Ideally, comparison would be made over a period of years to eliminate the effects of unusually high or low export prices which would affect the rate of profit.

In some cases inputs are clearly produced domestically (i.e. there are no imports of the good)[2], and in other clearly imported (i.e. there is no domestic production). This will have been noted under the Section 1 analysis. Where there are both imports and domestic production, the market share held by local suppliers is measured as follows:[3]

$$\frac{\text{Domestic Production}}{\text{Domestic Production + Imports − Exports (including Re-exports)}}.$$

This of course is a measure of import substitution.[4] Since import

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[1] This is the approach used by Hal B. Lary, Imports of Manufactures from Less Developed Countries (New York, 1968) to measure the capital intensity of production of less developed countries exports. Lary considers this a better measure than investment outlays since it takes account of the durability of capital goods. He also uses wage value-added as a measure of labour quality - of the human capital embodied in labour.

[2] For example electricity is domestically produced, except in South Johore until the early 1960's when it was supplied from Singapore. See United Nations, Electric Power in Asia and the Far East 1956-60 (Bangkok, 1962), p. 20. Similarly, until recently all diesel oil was imported.

[3] Alternatively, exports could have also been subtracted from domestic production in the numerator. This should show the actual market share held by domestic suppliers. The present measure shows the extent that domestic production could supply the local market assuming that local suppliers are not merely venting abroad goods which are not saleable locally.

[4] See United Nations, Import Substitution and Export Diversification in ECAFE Countries, ECAFE Growth Studies Series, No. 1, reprinted from Economic Survey of Asia and the Far East, 1963, (Bangkok, 1964), especially pp. 28-29.

substitution has been encouraged by various measures including tax relief and tariff protection in Malaysia for over a decade,[1] it will also be necessary to assess the effects of policy as far as possible in each case. It is especially interesting to see whether this ratio changes over time. Production data are available from 1959, in the form of the FM/WM Census - and Surveys of Manufacturing.

Domestic input-producing industries, once identified, will be described in terms of their capital intensity, employment, skill coefficients, etc. Similar treatment will be given to industries supplied by the export sector. A case study of one of the most interesting and important linkage effects is presented in Chapter VIII, which shows the relation between exports and the growth of the Malaysian engineering industry.

Final demand linkages require the collection of rather more data than already assembled. For this reason they are set out in a separate chapter (Chapter VII). The data required are of consumption patterns of workers in the export industries.[2] Information is derived principally from the 1957 Household Budget Survey of the Federation of Malaya. Consumption patterns of income and racial groups in each industry are set out and compared with imports in a similar fashion to the methods discussed above for inter-industry purchases and sales. Of course final

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1 See for example FM, Second Five Year Plan 1961-65, op.cit., pp. 18-20.

2 Insufficient information is available about the incomes of dividend receivers for a similar analysis to be carried out for them.

demand linkages are of particular importance because they alone determine the strength of the multipliers generated by export industry investment purchases and by current export receipts, respectively. As export revenue is spent, or investment expenditure made, the resulting payments diffuse through the economy in a series of input-output transactions. The final demand expenditure made by primary factors receiving this income at each stage in the series forms the first round of the export (or investment) multiplier. Ultimately of course all intermediate purchases will break down into primary factor payments or imports.[1] To the extent that local suppliers produce to meet this demand, investment is created via an accelerator,

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[1] Also, ultimately all export earnings must flow abroad again as import purchases or capital outflows (or be retained as foreign exchange reserves). Similarly, foreign investment must ultimately generate an import surplus if there is to be a transfer of real resources from abroad. What matters are their multiplier-accelerator effects in the meantime.

Section II - 3 Technological Externalities

The skill requirements of the export industries are set out in Cahpter VI. They will be presented in comparative form, the skills generated by each export being compared with each other and with branches of domestic manufacturing. Use will be made of coefficients of skilled labour per $x. of output. Since the generation of employment opportunities is an important part of current Malaysian policy,[1] aggregate labour requirements will be compared between industries and between sectors of industries. Also discussed is the diffusion of new technology from the export sector.

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[1] See First Malaysia Plan 1966-70, op.cit. The fourth of ten main objectives of the Plan is "To generate employment opportunities at a rate sufficient to promote productive work for new entrants to the labour force and lower the rate of unemployment". (p. 2).

CHAPTER IV

TIN

The first two sections are introductory. In the first section a brief history of tin mining in Malaya is presented as a background to more recent events. The second section outlines the mining methods whose effects are to be discussed. Section 3 is the body of the chapter, a breakdown over time of the structure of current payments of the tin industry. Section 4 discusses tin industry linkages, and section 5 deals with investment requirements and their effects.

Section IV-1 Historical Notes on Malayan Tin Mining to the First World War [1]

The early history of tin in Malaya is well known in broad outline. References were made by Arab writers in the ninth century to Malayan tin.[2] Both tin and gold were produced before the Portugese conquest of Malacca in 1511. In 1641 344 tons of tin were exported from Malacca. From the late 1700's to the mid nineteenth century about 6-9,000 pikuls (about 360-540 tons) were exported from Perak. In 1818 only 400 Chinese miners were in Perak and most of the mining was carried out by Malays.

Tin was first mined in the Larut district of Perak in 1848 by a Malay Chief who had been tranted sole concession rights in that area by the Sultan of Perak.[3] By 1870 40,000 Chinese were mining tin in Larut and the district had become the major tin producing area of Malaya. Disputes, culminating in open warfare between rival Chinese clans, led to large falls in both population and tin output and to the intervention of the British, already established in the Straits Settlements.[4] By

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[1] These details of the tin industry before 1874 were taken mostly from L.L. Fermor, Report upon the Mining Industry of Malaya (Kuala Lumpur, 1939), pp. 21-23.

[2] Tin itself was in use long before this. The first known object made of tin is from Ancient Egypt, dated from before 1400 B.C. See L.V. Deller, The World of Tin, (Kuala Lumpur, 1963), p. 2.

[3] Chai Hon Chan, The Development of British Malaya, 1896-1909, (Kuala Lumpur, 1964), p. 4.

[4] See Section I -.2.

the end of 1874 output had recovered and many of the Chinese who had left the district returned. Exports of tin from Larut rose rapidly, reaching a peak of approximately three quarters of Perak's output in 1884.[1] In Selangor also tin was being mined with 7,000 Chinese working in the mines around Kuala Lumpur in 1874. This rose to 23,000 by 1884. Three quarters of Selangor's output came from the Kuala Lumpur area.[2]

The Kinta Valley around Ipoh began to rival Larut as the main tin area in the mid 1880's. In 1885 the Resident of Perak noted an extensive migration of Chinese miners from Larut to other parts of the state,[3] which would have been mainly to Kinta. By 1889 Kinta's output surpassed that of Larut, and in 1910 its output was nearly seven times that of Larut,[4] and approximately 40% of the output of the FMS. Indeed, this shows the start of a strong regional bias in tin mining.

TABLE IV - 1 EXPORTS OF TIN FROM MALAYA 1875-1915, SELECTED YEARS

(Tons)

	PERAK	SELANGOR	NEGRI SEMBILAN	PAHANG	TOTAL FMS	TOTAL UMS	TOTAL MALAYA
1875	1,762	...	...	...	...	...	...
1880	5,247	3,007	...	...	...	...	...
1885	9,680	4,935	1,264	...	...	...	...
1890	14,117	10,389	2,142	327	26,975	...	...
1895	23,960	21,515	2,332	403	48,210	...	...
1900	21,166	16,041	4,301	936	42,444	...	...
1905	26,594	17,254	5,067	2,077	50,992	...	...
1910	25,080	14,297	2,065	2,421	43,863	1,137	44,999
1915	27,771	13,938	1,244	3,808	46,761	3,135	49,896

Sources and Notes: 1) Totals from Appendix IV - 1.
2) All 1915 figures from L.L. Fermor, Report upon the Mining Industry of Malaya, (Kuala Lumpur, 1939), p. 58.
3) All other figures from Wong Lin Ken, The Malayan Tin Industry to 1914, (Arizona, 1965), p. 249.

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[1] A.R., Perak, 1887.

[2] A.R., Selangor 1884 and 1885.

[3] A.R., Perak, 1885.

[4] A.R., Perak, 1910.

As can be seen from Table 1 the bulk of Malaya's output, over 80%, was produced by the two West Coast States of Perak and Selangor. Only some 7% in 1915 came from the Unfederated Malay States.[1] Comparison with Table 2 shows that by the 1890's production had reached a level comparable with later years.

TABLE IV - 2 PRODUCTION OF TIN IN WEST MALAYSIA, 1920-65, SELECTED YEARS

	TONS		TONS
1920	37,438	1945	3,152
1925	48,700	1950	57,767
1930	64,082	1955	61,244
1935	42,319	1960	51,979
1940	83,468	1965	63,670

Sources and Notes: 1) 1920-30 figures are exports, 1935 figures are sales from FMS and exports from UMS. 1945-65 figures are production. Since there is virtually no local consumption of tin, production = exports + change in stocks.
2) All figures from Appendix IV - 1.

The interrelations between tin mining and the development of the Malayan transport system and of urbanisation are interesting and will be dealt with more fully later in the chapter. Briefly, several of the present day major towns grew up as mining centres: Taiping in Larut, which region has continued as a dredging area, Ipoh in Kinta, Kuala Lumpur, and Seremban in Negri Sembilan.

The first railways connected these centres to seaports, whence ore was shipped to Penang or Singapore for smelting.[2] In 1885 eight

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[1] This trend continues to the present, when in 1968 nearly 90% of West Malaysian tin output came from Perak and Selangor. See CMinI, 1968.

[2] This account is taken from Chai Hon Chan, op.cit., Chapter V, supplemented by FMS Railways, Fifty Years of Railways in Malaya, 1885-1935 (Kuala Lumpur, 1935).

miles of track from Port Weld to Taiping were built by the Ceylon government under contract to the British authorities. Kuala Lumpur was connected to the port of Klang in 1886; Seremban to Port Dickson in 1891 and Ipoh to Telok Anson in 1895. By 1910 a line had been built from Prai (on the mainland by Penang Island) to Johore Bahru, and extended over the causeway to Singapore in 1923. This connected all the main mining centres and constitutes the basic west coast railway system of the present day.

Section IV - 2 Mining Methods

For purposes of analysis in Section 3 it is necessary to split the tin mining industry into sectors. These are as follows:

IV - 2i Dredging

A dredge is a structure which floats on a pond, or paddock, largely of its own making.[1] A continuous line of steel buckets at the front of the dredge digs the tin bearing ground from the bottom. The buckets are attached to a chain mounted on a metal ladder, which can be raised or lowered to vary digging depth. Ground from the buckets is delivered to a primary treatment plant on the dredge, where ore is treated to about 15% purity,[2] and the waste material ("tailings") is pumped over the back of the dredge. Ore is taken from the dredge to a dressing shed on shore where it undergoes further treatment to a purity of about 75%, before shipment to the smelter.

The capacity of dredging, or any other type of alluvial tin mining, is expressed in terms of a "yardage". The largest present day dredges

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[1] Excellent accounts of dredging technology, from which much of this account has been drawn, can be found in H.D. Griffiths, Bucket Dredging for Tin in the Federated Malay States, (London, 1917); W.R. Jones, Tin Fields of the World, (London, 1925); and a simpler account in L.V. Deller, The World of Tin, op.cit., Deller and Jones also describe other types of tin mining.

[2] A higher percentage could be obtained but it would increase the risk of theft on the way to the dressing sheds, a handful of ore at current prices being worth more than a labourer's daily wage.

can mine over 750,000 cubic yards of tin bearing earth a month. An average "large" dredge has a capacity of 500,000. A cubic yard weighs over a ton and ground yielding 1 lb of ore from a cubic yard would be considered exceptionally rich. Many large dredges can dig to a depth of 150 feet. The capacity of dredges has increased gradually over time. The earliest dredges had capacity of 80-100,000 cubic yards and could dig to 50 feet.[1] By 1924 new dredges could treat 200,000 yards a month[2] and by 1938 450,000 yards, with a digging depth of 130 feet.[3]

The first dredge was floated by Malayan Tin Dredging Limited at Batu Gajah in Kinta, although pioneer work on tin dredging had been done in Siam by two Australian Companies.[4] Dredges had first been used for mining gold in New Zealand and later in Australia.[5]

Technical changes in dredging have been mainly of two forms, both affecting the sector's input purchases. The first dredges were steam driven, using coal, first imported and later local, or firewood as fuel. By 1926 most newer dredges were using coal.[6] In 1935 of a

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[1] See Ooi Jin Bee, "Mining Landscapes of Kinta", p. 336, in T.H. Silcock (editor), Readings in Malayan Economics (Singapore, 1961).

[2] AR, Mines Department, FMS, 1924.

[3] AR, Mines Department, FMS, 1938.

[4] Wong Lin Ken, The Malayan Tin Industry to 1914, (Arizona, 1965), pp. 208-11.

[5] G.C. Allen and A. Donnithorne, Western Enterprise in Indonesia and Malaya, (London, 1954), p. 152.

[6] AR, Mines Department, FMS, 1926.

total of 119 dredges 77 were powered by steam and 42 by various forms of electricity. Today most use electricity. Machinery requirements for the primary treatment plant and shore dressing plants have become more complex. The earliest dredges "concentrated" (i.e. separated ore from waste material) on long sluices, similar to those of many present day gravel pump mines. The material from the buckets was delivered first into a trommel, a screen in the form of a revolving tube from the middle of which water was directed at high pressure. Large pieces of waste material flowed out of the end of the drum to a tailings chute, while the finer ore bearing material was forced through the holes in the screen onto a sluice. By 1925 jigs were being used instead of sluices.[1] A jig is a box with a perforated base, which pulsates, thus sieving the (heavier) ore out of the bottom whilst keeping the (light) waste material floating. By 1928 the number of dredges using jigs was roughly equal to the number using sluices[2] and today almost all use jigs. A further development is the use of hydrocyclones and pumps to improve the feed to the jigs by dewatering and desliming. These are dealt with more fully in the account of gravel pump mining which follows below. In the dressing sheds also, the use of wash boxes has been supplemented by magnetic and electrostatic separators and shaking tables.

IV - 2ii <u>Gravel Pumping</u>

In this form of mining the tin bearing ground is broken down by strong jets of water played against the walls of an open pit. The

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[1] AR, Mines Department, FMS, 1925.

[2] AR, Mines Department, FMS, 1928.

water is directed by rigid metal hose nozzles, or "monitors", each operated by one or two men. The liquid ore-bearing material washed down by the monitors flows through crudely cut channels to a hollow, or sump, whence it is elevated by means of a pump - the gravel pump - to the primary treatment plant, usually a sluice. The principle of this type of mining was imported from Cornwall, the centre of British tin mining, where high pressure jets of water were used to mine china clay.[1] [2] The first hydraulic mine was Gopeng in Perak, started in 1892.[3] This worked over 10,000 cubic yards a month with a work force of only 20. It used water under a natural head, brought over six miles from the Kampar River. C.G. Warnford-Lock[4] estimates that a single coolie in an open cast mine could move two cubic yards in a working day, equal to about fifty cubic yards a month. Therefore an unmechanised open cast mine would have to employ 200 coolies to treat the monthly Gopeng yardage, i.e. about ten times the number of workers actually employed by Gopeng. Originally the cut ground was recovered from artificial ditches by women washers but subsequently hydraulic elevators were used to raise the ore bearing material to a treatment plant.[5]

By 1905 there were nine hydraulic mines in the Federated Malay States.[6] The first use of artificial motive power to operate the jets

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[1] Allen and Donnithorne, op.cit., p. 147.

[2] Most Cornish tin mining was lode mining.

[3] AR, Perak, 1893.

[4] Mining In Malaya for Gold and Tin (London, 1907), p. 121.

[5] See F.D. Osborne, "Hydraulic Mining in the Federated Malay States", Mining World, March 1920.

[6] AR, Perak, 1905.

and the elevators was in 1906 at the Tanjong Rambutan mine in Perak, introduced from Tasmania.[1] This was the so-called suction dredge. Two pumps, mounted on a floating pontoon, operated a monitor to break down ground on the wall of the excavation, and a centrifugal gravel pump to elevate the slurry. Because of its high operating costs the method never became popular but it demonstrated the possibility of hydraulic mining operating with artificial power (i.e. gravel pumping), and it was rapidly adopted by Chinese miners who adapted it for use without the floating pontoon. By 1915 the Mines Department's details of principal workings in the Federated Malay States listed three mines, all in Perak, hydraulicing with power plant. In 1920 and again in 1924 the Mines Department noted the increasing use of gravel pumps.[2]

Technical change in the method of mining has been minor. In 1938 a new type of gravel pump was introduced, with an electric motor coupled to the pump in one portable unit. The motor was superimposed vertically on the pump. This eliminated the need for expensive foundations, thus allowing greater portability, and reducing liner wear.[3] Steam engines were replaced by diesel oil engines, which were themselves replaced to some extent by electricity. The first hydro-electric mining plant was set up in 1911[4] but electricity was not available for commercial purchase on a large scale until the end of the 1920's.

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[1] Wong Lin Ken, op.cit., p. 209.

[2] AR's, Mines Department, FMS, 1920 and 1924.

[3] AR, Mines Department, FMS, 1938.

[4] Wong Lin Ken, op.cit., p. 209.

The Perak River Hydro-electric Power Company started operations in 1928 and the first Government Steam Electric Plant in 1927. Previously only Pengkalen, a mining company turned power station, had supplied electricity commercially, and only on a relatively small scale.[1]

From the late 1930's, but more especially in the last twenty years earth moving equipment has been used more extensively to remove the overburden before gravel pumping.[2]

Primary treatment in many gravel pump mines has altered little in fifty years. The slurry raised by the pump is passed through the bars of a metal screen, or grizzly, to remove large pieces of stone etc. The screen is manned by a single operator armed with a pole with which the screen is kept clear of blockages. From the screen the remaining solids are run onto a long downward sloping sluice box, the "palong" where wooden strips (riffles) catch the ore on the bottom while the lighter material flows away to be pumped to a tailings dump.

Innovations have been of two kinds. First, the use of jigs as on dredges. Although figures are not available at the time of writing, it would seem that this was ruled out for many years both by capital costs and technological sophistication, and economies of scale in mechanical treatment plants. However in 1959 a new type of treatment plant was developed by the Federal Department of Mines. This, the hydrocyclonic-jig plant, was first investigated as a means of dealing with excessive slime in certain ore deposits which greatly reduced the recovery rate.[3]

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[1] Although there may have been private purchase agreements by one mine from another.

[2] United Nations, Mining Developments in Asia and the Far East, 1945-1965, (New York, 1964), p. 99.

[3] For a detailed description of this plant see J.H. Harris, "Innovations in Gravel Pump Treatment Plant", Mining Journal, January-February 1959., from which this account is taken.

The plant resulting from these experiments consisted of an improved screen (the "sieve-bend grizzly"), a low pressure hydrocyclone which deslimed and dewatered the feed to the jigs, along with other hydro-cyclones and jigs to retract some of the waste. Essentially, this plant allows the rejection of a much greater proportion of the solids pumped up for treatment, which in turn allows treatment by one quarter of the previous jig capacity. The recovery rate of ore is up to 50% higher than that of sluices treating the same amount of slurry. The capital cost, expressed as an annual charge, is little over half that of a palong. By 1962 one gravel pump mine in six was using hydro-cyclonic jig treatment.[1]

A typical gravel pump mine with a monthly yardage of 15-20,000, would employ approximately thirty men. A small dredge with a yardage of 250,000 would employ over a hundred men.[2] This gives a yardage per man in dredges of over three times that of gravel pump mines. For the larger dredges this ratio would be still higher.

IV - 2iii Open Cast Mining

This name is somewhat misleading. All gravel pump mining, and in a sense dredging too, is open cast. "Open cast" mining in Malaysian usage has the additional connotation that it is mining without the use of water - "dry mining" in the terminology of the industry.

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[1] United Nations, Mining Developments in Asia and the Far East, 1962, (New York, 1963), p. 61.

[2] Information based on personal visits in 1969.

Nowadays open cast mining is by means of mechanical excavators.[1] The famous Sungei Besi mine near Kuala Lumpur, for example, which produces about half of the total open cast output of Malaysia, uses two bucket wheel excavators, large self propelled tracked vehicles with digging buckets on a single revolving wheel, each excavator equipped with its own crushing plant. Ore from the excavators is sent by conveyor belt to a central treatment plant. Other parts of the mine use gravel pumps to work lower grade deposits, while buldozers and small excavators are used elsewhere. One especially rich deposit is worked by female dulang washers on contract.[2] Other open cast mines use mechanical excavators and at least one other bucket wheel excavator is in operation.

Open cast mining is one of the oldest forms of mining in Malaya.[3] The early open cast mines in Malaya in the nineteenth century, when open cast was the most important form of mining, were worked mainly by hand labour using only Chinese hoes (changkols) to dig the ground, and twin baskets slung on each end of a pole to raise the ore from the pit. Treatment was in simple sluice boxes, "lanchuts".[4] Machinery was

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[1] This dates from before the Second World War. The 1936 AR of the Mines Department noted the increasing use of mechanical excavators in open cast mines.

[2] Information based on a personal visit to Sungei Besi in November 1969.

[3] The other is lampanning, a method much used in the nineteenth century and even earlier by the Malay miners who proceeded the Chinese. Tin bearing ground is shifted into ditches into which water from a nearby stream is deflected, the lighter waste material being carried away by the stream and the ore deposited on the bottom. See W.R. Jones, <u>Tin Fields of the World</u>, <u>op.cit</u>., pp. 78-80.

[4] These originally were rather large - some thirty feet long, requiring a considerable head of water to operate successfully. In 1891 a short wash box was introduced, needing only five or six men to operate it. This was a substantial boost to small scale mining. See <u>AR</u> Perak 1891.

first introduced in 1877 with the purchase of a steam pump by the British Resident of Perak.[1] By 1886 sixteen steam pumps were working in Kinta of which ten were Chinese, one was foreign Malay, and five were operated by a French Company.[2] They enabled mines to be kept drained at a much greater depth than the earlier form of pump, the Chinese chin-chia water wheel. Their use spread rapidly. By 1904 there were nearly a thousand boilers and engines in Perak alone.[3]

By 1904 although most mines still used nothing except a steam pump, various other types of machinery were in operation in some European mines. Warnford-Lock[4] noted the use of steam engines to work lines drawing trucks on rails to remove overburden and carrying tin bearing ground. Also a number of mechanical puddling devices were in use to break down, prior to washing, deposits with a high incidence of clay.

IV - 2iv Underground Mining

Over three quarters of underground tin output is produced by a single European company, the Pahang Consolidated Corporation Limited, which has been in operation since 1887.[5] Little explanation is needed

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1 AR Perak 1887.

2 AR Perak 1886.

3 AR Resident-General, FMS, 1904.

4 Op.cit., p. 23.

5 See 60 years of Tin Mining. A History of the Pahang Consolidated Company Limited, 1906-66, published by the Company in 1967.

as the methods used are essentially similar to those used to mine coal underground in Western countries.

IV - 2v Dulang Washing

Dulang washers, mostly Chinese women, pan for tin in rivers and streams in a similar fashion to gold miners in early America. They are sometimes employed on contract by mines but often work independently.[1]

IV - 2vi Tin Industry Statistics, by Mining Method

Table 3 shows proportions of output produced by the different methods from 1928, the first year for which such statistics are available. Tables 5 and 6 show proportions of employment, with the absolute totals given in Table 4. It can be clearly seen that two methods, dredging and gravel pumping predominate from the 1920's, open cast mining rapidly declining after the introduction of these methods.[2]

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[1] For an interesting account of dulang miners see Siew Nim Chee, "Labour and Tin Mining in Malaya", in T.H. Silcock, (editor), Readings in Malayan Economics, op.cit.

[2] Indeed the decline in open cast mining is slightly understated since it includes employment in open cast iron mining, which has operated since at least 1921. Coal, mined from 1915 at Batu Arang in Selangor, may also have swollen the open cast figures. Coal was mined by both underground and open cast methods. No indication is given in official statistics of how coal mining employment was distributed between open cast and underground.

TABLE IV - 3 PRODUCTION OF TIN IN WEST MALAYSIA BY MINING METHOD, 1930-65, SELECTED YEARS

(Percentages)

	DREDGING	GRAVEL PUMPING	HYDRAULICING	OPEN CAST	UNDERGROUND	MISCELLANEOUS	DULANG WASHING
1928	30	45	8	6	6	2	2
1930	38	43	7	4	5	1	1
1935	45	41	5	2	4	1	2
1939	48	36	6	4	4	-	2
1950	49	35	4	1	5	-	5
1955	51	39	2	2	4	-	2
1960	54	34	2	2	4	1	2
1965	39	48	-	3	3	2	3

Sources and Notes: 1) 1928-39 are for FMS only.
2) All figures calculated from Appendix IV - 2.

TABLE IV - 4 WEST MALAYSIAN TIN MINING EMPLOYMENT, 1903-65, SELECTED YEARS

	ALL MINING	TIN MINING (EXCLUDING DULANG)	DULANG WASHERS
1903	186,337	...	...
1910	170,361	...	10,257
1915	164,457	...	15,859
1920	89,559	...	12,867
1925	107,257	...	7,792
1930	80,528	76,796	7,784
1935	62,844	57,263	9,701
1939	72,954	65,556	9,822
1950	53,200	47,201	18,702
1955	44,407	39,559	7,762
1960	36,736	29,242	7,889
1965	55,395	45,345	15,663

Sources and Notes: 1) 1903-39 are for FMS only.
2) The number of dulang washers is given by the number of dulang passes issued by the authorities.
3) All figures from Appendix IV-3.
4) Although for the early years no separate tin statistics are available it is certain that all but a negligible part of mining employment was in tin mining.

TABLE IV - 5 WEST MALAYSIAN MINING EMPLOYMENT, BY MINING METHOD, 1903-65, SELECTED YEARS

(Percentages of total mining employment)

	DREDGING	GRAVEL PUMPING	HYDRAULICING	OPEN CAST	UNDERGROUND
1903	-		12	77	...
1910	-		17	72	11
1915	1		20	72	7
1920	3		39	47	11
1925	7		46	27	7
1930	15	51	11	15	7
1935	17	49	8	18	8
1939	23	50	5	16	7
1950	33	51	5	...	...
1955	37	48	3	...	...
1960	39	44	4	4	10
1965	24	65	-	3	6

Sources and Notes: 1) 1903-39 are percentages of all mining employment. No separate figures for tin employment by method of mining are available until 1967 (see Table 6) except for dredging, which is given in the CMinI from 1964. However, dredging operations are virtually only for tin so little is gained from such information. 1950-65 are percentages of tin employment.
2) The underground percentage will be slightly overstated from 1915 to 1955 since it includes coal employment (coal mining ceased early in 1960). Open cast mining may also include coal, and certainly includes iron, at least after 1921. Iron mining employment figures are available for postwar period and have been subtracted from open cast employment to arrive at the figures for 1960 and 1965.
A similar operation was not possible for 1950 and 1955 because of the difficulty of allocating coal employment between opencast and underground. Employment in other mining such as gold or bauxite is not large enough to have a noticable effect on the percentages.
3) All figures calculated from Appendix IV - 3.
4) Dulang washers are excluded from the total.
5) 1903-39 are for FMS only.

TABLE IV - 6 TIN MINING EMPLOYMENT, BY MINING METHOD, WEST MALAYSIA, 1968

(Percentages of total tin mining employment)

DREDGING	GRAVEL PUMPING	HYDRAULICING	OPEN CAST	UNDERGROUND	OTHER
22	67	1	3	5	1

Sources and Notes: 1) HLS, 1968.

Dredging is identified with foreign ("European") ownership and control.[1] No locally initiated dredging operations existed until 1963, when the Selangor Dredging Company, under Chinese control, came into existence. A second Chinese dredge, privately owned, started operations early in 1969.[2] Gravel Pump and Hydraulic Mining is predominantly Chinese, although some major companies are European, e.g., The Sociêtê Anonyme des Etains de Kinta, Gopeng Consolidated. The main open cast and underground mines, Sungei Besi and Pahang Consolidated, respectively, are also European. Nevertheless European importance in tin dates from the introduction of dredging in 1912 as can be seen from Table 7, which shows the proportions of output produced by Chinese and European mines. The predominance of European mining emerged before the Second World War and

TABLE IV - 7 PERCENTAGES OF OUTPUT FROM CHINESE AND EUROPEAN TIN MINES IN WEST MALAYSIA, 1910-67, SELECTED YEARS.

	CHINESE	EUROPEAN
1910	78	22
1915	72	28
1920	64	36
1925	56	44
1930	37	63
1935	34	66
1939	31	69
	Asian	
1966	42	58
	Malaysian	Foreign
1968	58	42

Sources and Notes: 1) 1910-39 from AR Mines Department FMS 1939.
2) 1966 and 1968 from CMinI 1966 and 1968. A "Malaysian" firm is one where Malaysians own over 50% of the share capital.

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[1] Section 3 shows, however, that ownership at least (if not control) is spreading to local people.

[2] Information obtained from visit to this dredge in November 1969.

and continues to the present. The fall in the 1960's of the proportion of dredging output and employment is due to a relative rise in the output of gravel pump mining and reflects only a small absolute fall in dredging output and employment. Very few mines are owned by Malays or Indians, although some help is currently being given by the Mines Department to encourage Malay mining in Malay reservations.[1]

The labour force is mainly Chinese, although Malay (and Indian) participation is increasing especially in dredging, as can be seen in Tables 8 and 9.

Employment in dulang mining is shown separately in Table 10. Again, Chinese predominance is marked, but with a steady rise in Malay participation in the 1960's.

TABLE IV - 8 RACIAL COMPOSITION OF WEST MALAYSIAN MINING LABOUR FORCE, 1911-67, SELECTED YEARS

(Percentages)

<table>
<tr><th></th><th>MALAY</th><th>CHINESE</th><th>INDIAN</th><th>EUROPEAN</th><th>OTHER</th></tr>
<tr><td>1911</td><td>1</td><td>96</td><td>2</td><td>-</td><td>-</td></tr>
<tr><td>1915</td><td>1</td><td>94</td><td>3</td><td>1</td><td>-</td></tr>
<tr><td>1920</td><td>3</td><td>93</td><td>4</td><td>-</td><td>-</td></tr>
<tr><td>1925</td><td>2</td><td>86</td><td>9</td><td>-</td><td>-</td></tr>
<tr><td>1930</td><td>3</td><td>88</td><td>8</td><td>1</td><td>-</td></tr>
<tr><td>1935</td><td>5</td><td>84</td><td>10</td><td>1</td><td>-</td></tr>
<tr><td>1938</td><td>7</td><td>79</td><td>13</td><td>1</td><td>-</td></tr>
<tr><td>1947</td><td>13</td><td>76</td><td>10</td><td>1</td><td>-</td></tr>
<tr><td>1957</td><td>16</td><td>72</td><td>10</td><td colspan="2">2</td></tr>
<tr><td>1968</td><td>18</td><td>71</td><td>10</td><td colspan="2">1</td></tr>
</table>

Sources and Notes: 1) 1911-38 from AR's Mines, FMS: Percentages of all mining labour
2) 1947 and 1957 from A Report on the 1947 Census of Population Malaya, and 1957 Population Census, FM, Report No. 14, Final Report, respectively. These have been used in preference to Mines Department sources as they refer to tin mining employment.
3) 1968 from HLS, 1968 and refers to proportions of tin mining labour force.
4) Dulang washers are excluded.

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[1] First Malaysia Plan, 1966-70., p. 129.

TABLE IV - 9

RACIAL COMPOSITION OF TIN MINING LABOUR FORCE, WEST MALAYSIA, 1968

(Percentages of Total Workers in Each Category)

	MALAY	CHINESE	INDIAN	OTHER
Gravel Pumping	10	83	6	-
Dredging	37	37	24	2
Open Cast	19	65	15	1
Underground	30	67	2	1
Hydraulic	19	65	12	4
Other	24	63	13	-
All Tin Mining	18	71	10	1

Sources and Notes: HLS, 1968.

TABLE IV - 10

RACIAL COMPOSITION OF DULANG LABOUR FORCE, 1913-65, SELECTED YEARS

	MALAY	CHINESE	INDIAN
1913	14	84	2
1935	8	90	1
1938	8	90	1
1950	2	97	-
1955	3	96	-
1960	6	94	-
1965	32	67	-

Sources and Notes: 1) A full range of pre-war figures was not collected but those available show the predominance of Chinese quite clearly. The rise in Malay participation in 1965 is a continuing trend in the 1960's.
2) 1913-38 from AR's Mines Department, FMS.
3) 1950-65 from BSMI's.

IV - 2vii Smelting

Virtually all Malaysian tin is smelted in roughly equal proportions by two European companies, the Straits Trading Company with works at Butterworth, and the Eastern Smelting Company with works on Penang Island.[1] Both companies have a long history, the former being established in 1887 and the latter in 1897. In 1965 a new smelter, Oriental Tin Smelters Limited, owned jointly by Malaysian and Japanese interests was set up near Klang in Selangor,[2] only to close in 1969. The two main companies apparently were working slightly below capacity, and Oriental Tin Smelters were unable to secure a large enough share of ore for efficient operation.

In the early years of the industry, economies of scale in smelting made for a rapid replacement of local small scale smelters by the two main companies, and by the 1930's only a few local firms were left, the main one being Tan Ban Joo in Kuala Lumpur, who did not restart operations after the Second World War. Competition from other countries for the smelting of Malaysian ore was dealt with in 1903 by a 33% export duty on tin concentrates (i.e. tin ore) exported to countries other than Great Britain and Australia. Of course, the 25% reduction in weight of ore following smelting gave a considerable degree of natural protection to domestic smelting.

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[1] The historical part of this account is from K.C. Trengonning, Straits Tin. A Brief History of the First Seventy-Five Years of the Straits Trading Company Limited, 1887-1962 (Singapore, undated), supplemented by information from the AR's of the Mines Department.

[2] United Nations, Mining Developments 1945-65, op.cit., p. 99.

Today the Straits Trading Company employs some 600 workers,[1] most of whom are in the Butterworth Smelting works.[2] The Eastern Smelting Comapny employs a total of 540 with another 85 on contract.[3]

IV -. 2viii Reasons for Co-existence of Different Mining Methods

This is mainly a question of how both dredging and gravel pump mining have been able to co-exist. The reasons for existence of a small number of open cast, underground, and hydraulic mines is easy to explain. Open cast mining using mechanical excavation is used only with exceptionally high grades of ground. For example Sungei Besi, the main open cast mine, and a highly profitable undertaking, worked ground in 1968 yielding over 1 lb per cubic yard, with operating costs of 100d. per cubic yard. These costs are about ten times the cost of treatment by the most efficient dredges, but many dredges work ground of less than .3 lbs per cubic yard, and .5 is very high.[4] Such operating costs would be little offset by lower capital charges relative to dredging, and are only tolerable because the high grade of ground allows a much lower monthly yardage to be treated. Underground mining works primary deposits of tin (lodes) which cannot be mined by alluvial methods. Hydraulic mining is a special case of gravel pump mining, where a natural head of water is available.

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1 Private communication from the Company, March 1970.

2 Interview with Straits Trading Company, Butterworth, November 1970.

3 Interview with Eastern Smelting Company, Georgetown, Penang, November 1970.

4 Figures from Zorn and Leigh-Hunt, Manual of Tin Mining Companies 1969, (London, 1969, published annually for private circulation since 1967).

Although cost figures for Chinese gravel pump mines are difficult to obtain, it is generally accepted in the industry that both their operating and total costs per cubic yard are higher than those of dredges. They must therefore work a higher grade of ground to survive.[1] Certainly comparisons with European gravel pump mines bear out this contention.[2] The reasons why dredging has not taken over completely therefore seem to be three. First, historical accident. Dredges need relatively large areas in order to function properly. Many areas already alienated to mining before dredging was introduced were much too small for dredges. The gravel pump was very suitable for such areas, with its higher operating costs but much lower initial capital cost. Second, dredges are suitable only for certain kinds of ground. They work best where there is a flat bed rock as in the Larut area around Taiping, Perak, where dredges were able to rework areas already mined by open cast methods. Where the bed rock is of limestone pinnacles, as in most of Kinta, the dredges cannot get into the pockets of ore between the pinnacles. The so-called suction cutter dredges were tried in these conditions. These were dredges with a revolving cutter at the end of a flexible steel tube, which could be lowered to the bottom. The ground was elevated by a pump. In fact they had relatively high operating costs, aggravated by the inefficiency of pumping where ground cut could easily disperse into the water around it. Their high operating costs

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[1] This supposition is borne out in relation to operating costs at least by the aggregate cost data to be presented in Section 3.

[2] See Zorn and Leigh-Hunt, op.cit.

were not offset by low capital charges.[1] Gravel pumps are a much more efficient method of working such deposits. Third, gravel pumps are able to work hill-side deposits and dredges are not. In the Kinta Valley there is a tendency for dredges to concentrate on the valley flats and gravel pumps to work the foothills.[2]

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[1] See Jones, op.cit., pp. 87-88.

[2] See Ooi Jin Bee, "Mining Landscapes of Kinta", op.cit., p. 359.

Section IV - 3 Current Payments Structure

The methods of analysis are those outlined in Chapter III, which also gives a discussion of the conceptual problems involved. The data split into four periods. 1963-68 is the period covered by the Censuses of Mining Industries in West Malaysia. For 1946-62 series can be constructed for wages and some other important inputs. A wider range of input series is available for 1910-39, although the statistics themselves are less reliable. No regular series exist for before 1910, and a picture has to be built up from qualitative information and statistical fragments. Calculations of input series are set out in appendices. An attempt to estimate tin industry production functions for the 1947-66 period is made in Subsection 3iv.

IV - 3i 1963-68

The Census of Mining Industries gives aggregate values of wages, labour benefits, and materials for all tin mining for 1963, and for dredging and "all other tin mining" for 1964-8.[1] Table 11 is a summary of this information, and provides a basis for comparison between the sectors. Dredging, as would be expected from its higher capital requirements[2] shows the higher total value-added (column vii) and non-wage

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[1] Similar information is also given for the mining of other materials such as iron ore.

[2] See Section 5.

value-added (column vi). It is less labour intensive than "other tin"[1] but also less materials-intensive. In fact the difference in intensity of materials use is more marked than that of labour. Dredging can crudely be identified as a foreign sector and "other tin" as a domestic sector.[2] From 1965 the total profits of "other tin" exceeded those of dredging, indicating the large amount of domestic capital formation which has taken place in gravel pumping. Table 13 provides a check on the Census wages by comparing them to wages calculated from Ministry of Labour sources in Subsection 3ii.

For all tin mining and for each sector from 1964 the proportion of both gross profits and total value-added has fallen. This is partly a reflection of changes in the price of tin (which fell from 1965 to 1968), which would lower these proportions by reducing gross proceeds with given costs per unit of ore. In fact also, as Table 12 shows, cost per pikul of ore ("concentrates") rose from 1964 to 1967 in dredging and 1964 to 1965 in "other tin". During 1964 to 1968 the grade of ground worked by dredges deteriorated from 0.29 to 0.25 katis per cubic yard;[3] a deterioration of approximately 14% compared to a rise in costs per

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[1] "Other tin" of course is principally gravel pumping. In 1965 gravel pumping accounted for approximately 86% of "other tin" output. See Table 5, and Appendix IV - 2. "Other tin" excludes amang treatment plants.

[2] This crude split must be modified by: a) the fact that dredging companies' shares are increasingly being purchased by local people; b) that 10% of "other tin" mining is in the hands of "European" companies (CMinI, 1968).

[3] Annual BSMI's 1964-68.

TABLE IV - 11 CURRENT PAYMENTS STRUCTURE OF TIN MINING IN WEST MALAYSIA, 1963-68

Current payments as % of Annual Value of Output

	(i) ANNUAL VALUE OF OUTPUT ($000)	(ii) TOTAL PAYMENTS TO LABOUR	(iii) VALUE OF FREE FOOD	(iv) VALUE OF FREE MEDICAL BENEFITS	(v) TOTAL MATERIALS	(vi) GROSS PROFITS	(vii) TOTAL VALUE ADDED	(viii) EXPORT DUTY
a) All Tin Mining								
1963	444,961	19.5	...	...	13.6	66.9	86.4	16.0
1964	590,987	15.6	1.3	0.1	13.7	69.3	86.3	15.9
1965	713,523	15.3	1.5	0.1	14.8	68.3	85.2	15.3
1966	707,675	17.6	1.9	0.1	17.9	62.5	82.1	15.2
1967	691,784	18.5	2.0	0.1	19.8	59.6	80.2	15.4
1968	680,840	18.3	2.0	0.1	18.4	61.2	81.6	16.5
b) Dredging								
1964	266,146	11.7	-	0.2	8.3	79.8	91.7	As
1965	293,067	11.1	-	0.2	9.7	79.0	90.3	for
1966	255,226	13.1	-	0.2	12.3	74.4	87.7	All
1967	240,334	14.8	-	0.2	13.7	71.3	86.3	Tin
1968	219,557	14.9	-	0.2	11.8	73.1	88.2	Mining
c) "Other Tin Mining"								
1964	324,841	18.8	2.3	0.1	18.2	60.6	81.8	As
1965	420,456	18.2	2.6	0.1	18.4	60.7	81.6	for
1966	452,449	20.2	3.0	0.1	21.0	55.7	79.0	All
1967	451,450	20.5	3.1	0.1	23.1	53.2	76.9	Tin
1968	450,440	20.3	3.0	0.1	22.1	54.5	77.9	Mining

Sources and Notes: 1) All figures from, or calculated from, CMinI 1963-8. Separate figures for dredging and other tin mining are not given for 1963.
2) Costs include a very small (less than 1%) element of costs of producing other minerals which are by-products of tin mining.
3) Column vi = 100% - (columns ii to v); Column vii = 100% - column v.
4) Annual values of production = Pikuls Tin Concentrates X 0.75 (to convert to metallic tin) X $ Price per Pikul (From Appendix IV - 4). Most curiously, the values of production in the Censuses appear to be given net of export duty and smelters charges. For example for 1964-7 values of dredge output calculated by our method were from only 81% to 85% of tin values quoted for the same physical output in the Censuses. No explanation of this unusual practice is given. Subsequent correspondence with the Department of Statistics (July 1970) confirms that the production figures are net. The Department promises that a note will be inserted to this effect in future editions of the Census.
5) Export duty has been assumed to be the same percentage of annual output for dredging and 'other tin mining' as for all tin mining. This is correct only if these sectors' outputs are in the same proportion to exports as is the output of the whole industry, i.e. if stock holding patterns do not differ between sectors. There is no *a priori* reason to suppose that patterns do differ.

TABLE IV - 12

TIN MINING COSTS AND PROFITS, 1963-68

(per Pikul Concentrates)

($)	(i) COSTS PER PIKUL	(ii) GROSS RECEIPTS PER PIKUL	(iii) GROSS PROFIT PER PIKUL	(iv) PRICE PER PIKUL METALLIC TIN
a) All Tin Mining				
1963	110.5	333.7	223.2	445
1964	143.0	464.2	321.2	619
1965	167.2	526.5	359.3	702
1966	181.9	483.8	301.9	645
1967	182.4	450.0	267.6	600
1968	167.0	423.7	256.7	565
b) Dredging				
1964	93.7	As	370.5	As
1965	110.3	for	416.2	for
1966	123.8	All	360.0	All
1967	129.4	Tin	320.6	Tin
1968	113.8	Mining	309.9	Mining
c) "Other Tin Mining"				
1964	183.4	As	280.8	As
1965	206.9	for	319.6	for
1966	214.6	All	269.4	All
1967	210.6	Tin	269.2	Tin
1968	192.8	Mining	230.9	Mining

Sources and Notes: 1) Column i is Total Costs (from Table 1) ÷ Total Output of Concentrates (from CMinI 1963-68). Column ii = Column iv x 0.75, since tin concentrates contain approximately 75% metallic tin. Note that Column ii is gross receipts, i.e. gross of export duty and smelters charges (see note 4, Table 11).
2) Column iii = (Column ii - Column i).
3) Column iv from Appendix IV - 4.

TABLE IV - 13 COMPARISON OF TIN MINING WAGE BILLS AS PERCENTAGE OF VALUE OF OUTPUT, 1963-68, FROM MINISTRY OF LABOUR AND MINING CENSUS SOURCES

	DREDGING AND GRAVEL PUMPING	ALL TIN MINING	DREDGING		GRAVEL PUMP MINING	ALL OTHER TIN MINING
	CALCULATED WAGE BILL	CENSUS WAGE BILL	CALCULATED WAGE BILL	CENSUS WAGE BILL	CALCULATED WAGE BILL	CENSUS WAGE BILL
1963	16.8	19.5	14.1	...	19.9	...
1964	14.9	17.0	13.1	11.9	16.6	22.2
1965	16.0	16.9	13.7	11.3	17.9	20.9
1966	16.7	19.6	12.3	13.3	19.5	23.3
1967	18.2	20.6	14.8	15.0	20.2	23.7
1968	18.5	20.4	15.0	15.1	20.3	23.4

Sources and Notes: 1) For Calculated Wage Bills see Appendix IV - 8.
2) For Census Wage Bills, see Table 11.
3) All Wage Bills include benefits except for free accommodation, which is not valued in the Census and has therefore been excluded from the Calculated Wage Bills. Calculated Wage Bills do not include an estimate of free medical expenses; however, in Census figures these were only 0.2% for Dredging and 0.1 overall.

pikul of 21%. The rise in materials costs is somewhat puzzling, as neither electricity nor diesel unit costs (the main material items) rose from 1965 to 1966, the year of the largest rise in costs although there was a 17% rise in the highspeed diesel price from 1966 to 1968.[2] Thus there appears to have been a rise in materials cost per cubic yard. In May 1964 a wages agreement for dredge workers gave a rise

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1 For electricity unit values see Appendix IV - 10. Diesel unit values from Annual BSMI's, 1963-68.

of 6% in basic wage rates, for a period of 2 years 8 months,[1] which accounts for part of the wage increase.

Further information about the structure of the tin industry as a whole can be had from the 1965 Interindustry Accounts of West Malaysia. These show that for Mining,[2] payments to primary factors of production (i.e. value-added) was 84.4% of gross output.[3] Labour payments were 27.9%, entrepreneurial income 72.1% of primary factor payments net of indirect tax, which is appreciably more capital intensive than for the economy as a whole, where labour earnings were 41.9% and entrepreneurial earnings 58.1% of value-added (excluding indirect taxation) in 1965.

Table 14 gives a detailed breakdown of materials purchased. It is immediately apparent that most materials are fuel.

Local production of these materials is dealt with in Section 4. It may be noted here that it is "other tin" which is the main purchaser of every major item. Indeed in 1968 "other tin" bought over 75% of the total value of materials purchased while accounting for only 65% of total output.

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[1] See Lee Thong Cheng "A Study of Employment and Wage Structures in European Dredges and Chinese Gravel Pump Mines in Malaya" (University of Malaya B.A. Graduation Exercise, Kuala Lumpur, 1964/5).

[2] Tin mining was 80% of the value of all mining output in 1965. See CMinI, 1965.

[3] This compares to 54.2% for the economy as a whole. This measure is adopted from H.B. Chenery and T. Watanabe, "International Comparisons of the Structure of Production", Econometria, October 1958, p. 492. Chenery and Watanabe take intermediate purchases as a proportion of total value of output, which for West Malaysia is 45.8% (i.e. 100-54.2). This is within the range 40% to 50% which they found to be an average for a number of countries, both developed and less developed.

TABLE IV - 14

MATERIALS PURCHASES OF TIN INDUSTRY, 1963-68: MINING CENSUS DATA

($000)	(i) DIESEL OIL	(ii) PETROL	(iii) KEROSENE	(iv) WOOD FOR FUEL	(v) OTHER FUELS	(vi) ELECT-RICITY FROM CEB	(vii) ELECT-RICITY FROM PRHEP CO.	(viii) OTHER ELECT-RICITY	(ix) LUBRI-CATING OIL AND GREASE	(x) EXPLO-SIVES	(xi) TIMBER (NOT FOR FUEL)	(xii) IRON CAST-INGS	(xiii) CEMENT	(xiv) CHEMICALS	(xv) OTHER MATERIALS
a) All Tin															
1963			----21,810----			19,472	15,261		2,914	333			----799----		
1964	23,170	846	39	951	1,152	13,377	22,256	374	4,064	436	5,628	8,536	259	...	55
1965	31,205	1,090	51	1,016	778	15,426	25,719	260	4,997	566	6,707	10,043	383	114	7,313
1966	39,035	1,273	77	1,043	832	17,468	27,049	621	5,672	607	7,503	12,680	447	253	12,157
1967	44,565	1,377	43	971	640	18,759	28,613	456	5,973	567	7,350	12,543	279	304	14,743
1968	43,891	1,564	38	772	628	19,899	31,153	471	6,020	572	7,041	12,954	310	319	...
b) Dredging															
1964	1,054	329	17	753	943	8,746	7,314	4	725	8	351	1,703	39	...	41
1965	1,041	349	15	723	678	9,398	8,311	-	684	-	426	1,700	49	55	4,952
1966	1,070	318	13	687	699	9,645	7,761	-	686	-	355	1,901	78	171	8,082
1967	798	350	10	581	564	10,574	7,856	-	652	-	293	1,841	33	252	9,176
1968	652	419	7	397	614	11,191	9,345	-	662	-	302	2,030	34	225	...
c) Other Tin Mining															
1964	22,116	517	22	198	209	4,631	14,942	370	3,339	428	5,277	6,833	220	...	14
1965	30,164	741	36	293	100	6,028	17,408	260	4,313	566	6,281	8,383	334	59	2,361
1966	37,965	955	64	356	133	7,823	19,288	621	4,986	607	7,148	10,779	369	82	4,075
1967	43,771	1,027	33	390	76	8,185	20,757	456	5,321	562	7,057	10,702	246	52	5,567
1968	43,239	1,145	31	375	14	8,708	21,808	471	5,358	572	6,739	10,924	276	94	...

Sources and Notes: 1) All figures from CMinI 1963-68.
2) 1964 figures for Other Materials include only water.
3) CEB = Central Electricity Board; PRHEP CO. = Perak River Hydro-Electric Power Company.

Additional information on dredging companies' costs, profits, etc., which can be used to supplement the CMinI data, can be compiled from individual company statistics to be found in the Manual of Tin Mining Companies, produced annually since 1967 by the London Stockbrokers, Messrs. Zorn and Leigh-Hunt.[1] The Manuals give data going back to 1963 (and to 1962 for a few companies) for all companies whose shares are traded on the London Stock Exchange.[2] Table 15 summarizes the Zorn and Leigh-Hunt data. The importance of gross profits is clear from the Table. These ranged from over 50% to nearly 70% of gross export income in the 1963-68 period. Gross profits are less than those calculated as a residual after wages and materials payments were deducted from gross export income in Table 11. This is to be expected since companies have costs in addition to labour and materials. Taxes and export duties take nearly 40% points of export income, leaving some 20% for dividends.

To supplement in turn the Zorn and Leigh-Hunt statistics a random sample survey of the annual reports of nearly half of the UK-incorporated dredging companies was taken, together with as many Malaysian companies

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[1] Information is also given about a small number of European gravel pumping and open cast mines. See Table 22.

[2] For a list of these companies see Table 15, note 3. Companies quoted on the London Stock Exchange include the two largest Malaysian-incorporated firms, Berjuntai and Petaling, which together account for over 60% of the issued capital of all Malaysian-incorporated dredging companies (see Appendix IV-7). The companies quoted in the 1969 Manual accounted for 78% of all dredging output; and the companies in the 1967 Manual for 98%. Fewer dredging companies are now quoted on the London Stock Exchange than in 1967 and earlier years because, with increasing Malaysian ownership of shares, quotations tend to be shifted to the Malaysian Stock Exchange. (I am indebted for this point to the compiler of the Manual, Mr. R.T. Jacobson - interview, March 1970).

TABLE IV - 15

DREDGING COMPANIES PROFITS, TAX AND DIVIDEND PAYMENTS, 1963-68: ZORN AND LEIGH-HUNT DATA

(Items as percentages of annual value of output)

	ALL 1969 QUOTED COMPANIES					ALL 1968 QUOTED COMPANIES		
	(i) NET PROFIT BEFORE TAX	(ii) GROSS PROFIT BEFORE TAX	(iii) GROSS PROFITS BEFORE TAX, LESS OTHER PROCEEDS	(iv) TAXES	(v) NET DIVID-ENDS	(vi) NET PROFITS BEFORE TAX	(vii) TAXES	(viii) NET DIVID-ENDS
1963	50.8	66.3	61.0	21.0	26.9	49.4	20.3	26.6
1964	42.2	57.2	55.3	17.6	24.5	42.1	17.5	23.9
1965	53.4	68.0	64.2	24.0	25.9	53.9	25.0	26.1
1966	53.1	67.5	61.0	24.6	26.2	53.4	25.0	27.0
1967	46.1	60.8	56.5	21.8	24.4	46.9	22.7	24.0
1968	39.2	54.6	51.0	18.5	19.1	...	...	...

Sources and Notes: 1) Net Profit (Column i) is profit after deductions of export duty, smelters charges, etc; Column ii = Column i + Column vi of Table 23. Both columns i and ii include receipts other than from sales of tin ore (investment income, etc.) Column iii = Column ii - Column vii of Table 16. Column ii provides a basis for comparison with column iii and iv of Table 17.

2) Columns i, iv and v, from Messrs. Zorn and Leigh-Hunt, Manual of Tin Mining Companies, op.cit.

3) Dredging companies quoted on London Stock Exchange in 1969 were as follows, the country of incorporation being given in brackets. An asterisk indicates that they are companies included in the sample of Table 16: *Ampat Tin Dredging Limited (UK), *Ayer Hitam Tin Dredging Limited (UK), Berjuntai Tin Dredging Berhad (Malaysia),*Kamunting Tin Dredging Limited (UK), *Killinghall Tin Dredging Limited (UK), *Kinta Kellas Tin Dredging Company Limited (UK), Malayan Tin Dredging Limited (UK), *Pengkalen Limited (UK), *Petaling Tin Berhad (Malaysia), *Renong Tin Dredging Company Limited (UK), Southern Kinta Consolidated Limited (UK), Southern Malayan Tin Dredging Limited (UK), *Sungei Way Dredging Berhad (Malaysia), Tanjong Tin Dredging Limited (UK), and Tronoh Mines Limited (UK).

4) In addition, in 1968 the following companies were also quoted: Kampong Lanjut Tin Dredging Berhad (Malaysia), Kent (FMS) Tin Dredging Limited (UK), Kramat Tin Dredging Berhad (Malaysia), Larut Tin Fields Berhad (Malaysia), Taiping Consolidated Berhad (Malaysia) Lower Perak Tin Dredging Berhad (Malaysia).

Columns vi, vii and viii, give results for all dredging companies quoted 1963-7, except that 1967 figures not available for Kent, Larut and Taiping.

whose reports could be obtained from Malaysia within a given period of time.[1 2] Annual reports of companies gave data on the proportion of operating costs in total costs, repairs and renewals, depreciation, U.K. tax and expenses (in the case of UK companies), and proceeds other than from the sale of tin, none of which information was in Zorn and Leigh-Hunt. The results of the survey are shown in Table 16, and confidence intervals for total costs (and, conversely, total profits) in Table 17. Unfortunately, the sample companies' costs are high relative to those in Zorn and Leigh-Hunt. This is likely to have been because the random sample excluded (purely by chance) companies like Berjuntai, which are very large and operate at low costs. Nevertheless, the sample fulfills its main aim of providing supplementary information. Operating costs are shown to be about 10% points below total costs. U.K. expenses are slight, and U.K. taxes paid are negligible compared to Malaysian taxes. Depreciation allowances are only about 5% points of gross revenue, although it is possible that larger and more efficient companies make larger provisions for depreciation.

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[1] In the Straits Times Directory 1969 (Singapore, 1969) from which the company names and addresses were taken, only Pacific Tin Consolidated Corporation (USA) was incorporated outside the UK or Malaysia. No reply was received from Pacific.

[2] There is no reason to suppose that this method of obtaining Malaysian company reports introduced any systematic bias into the sample. The UK companies were chosen by a purely random procedure.

TABLE IV - 16

DREDGING COMPANIES SAMPLE: CURRENT PAYMENTS AND DISPOSITION OF GROSS PROFITS, 1963-68.

(Items as percentages of annual value of output)

	COMPOSITION OF COSTS					PROFITS		PAYMENTS FROM PROFITS				
	(i) OPERATING COSTS	(ii) REPAIRS AND RENEWALS	(iii) DEPRECIATION	(iv) UK EXPENSES	(v) TOTAL COSTS	(vi) TOTAL GROSS PROFITS FROM SALES OF TIN	(vii) OTHER PROCEEDS	(viii) MALAYSIAN EXPORT DUTY	(ix) MALAYSIAN TAXES	(x) UK TAX	(xi) NET DIVIDENDS	(xii) SURPLUS OR DEFICIT OF PROFITS AFTER DEDUCTIONS (COLUMNS (vi + vii) - (viii + ix + x + xi)
1963	45.3	7.5	6.0	2.2	57.6	42.4	5.3	15.5	12.0	1.6	15.3	+ 3.3
1964	41.2	4.3	5.5	1.7	54.5	45.5	1.9	15.0	12.8	1.0	18.9	- 0.4
1965	36.1	3.4	4.4	1.2	45.3	54.7	3.8	14.6	18.4	0.7	19.7	+ 5.1
1966	42.4	3.5	5.1	1.3	51.2	48.8	6.5	14.4	13.1	1.6	18.8	+ 7.3
1967	49.1	3.2	6.5	1.7	62.0	38.0	4.3	14.7	10.9	0.7	15.6	+ 1.8
1968	55.3	3.2	5.9	1.5	67.9	32.1	3.6	15.4	6.5	0.8	9.5	+ 3.4

Sources and Notes: 1) All figures, except export duty, are calculated from the annual reports of a random sample of nine dredging companies, approximately a quarter of the total number (35). Export duty calculated from aggregate data from Mines Department sources: percentages differ slightly from those in Table 11 calculated with respect to CMinI volume of output data.

2) Operating Costs include Repairs and Renewals. Other Proceeds include tribute, receipts from sales of other minerals, and income from investments and sales of assets. It should be noted that it is often the practice in the industry to sell capital assets which are not to be used in the immediate or foreseeable future.

3) Column vi = 100 - Column v.

4) The gross output figures with reference to which the individual percentages are calculated were in some cases not available from the company reports. A number of companies showed the net instead of the gross receipts from sales of tin ore. Net receipts are the actual payment received from the smelter, i.e. the gross value of ore minus export duty, smelting charges and transport costs, which in total are usually at least 15%. In such cases, the net value of output has been prorated by 1.176 (100/85) in order to arrive at the approximate gross value.

5) The starting point for the year covered by company reports varies. This would tend to smooth annual variations in the individual percentages.

6) For more details of the sample, see Appendix IV - 6.

TABLE IV - 17 DREDGING COMPANIES SAMPLE: CONFIDENCE INTERVALS AT 5% LEVEL OF SIGNIFICANCE FOR TOTAL COSTS AS PERCENTAGE OF ANNUAL VALUE OF OUTPUT

	(i) MINIMUM TOTAL COSTS	(ii) MAXIMUM TOTAL COSTS	(iii) MAXIMUM GROSS PROFITS	(iv) MINIMUM GROSS PROFITS
1963	52.0	63.1	48.0	36.9
1964	46.3	62.8	53.7	37.2
1965	33.8	56.7	66.2	43.3
1966	41.9	60.5	58.1	39.5
1967	50.9	73.2	49.1	26.8
1968	56.7	79.1	43.3	20.9

Sources and Notes: 1) Limits calculated using Student t distribution and finite population correction factor. See Appendix IV - 6.
2) Sources are as for Table 16.
3) Columns iii and iv = 100 - Columns i and ii, respectively.

The most interesting feature of the results is the size and allocation of profits. It was shown above that gross profits are about 60% of export income. Profits are the obvious item to flow abroad from an export industry "enclave". In fact nearly two-thirds of these profits are retained by the Malaysian government as export duty and income tax. Export duty has been constant at about 15% of gross output value for the whole of this century.[1] Income tax was first imposed on companies in Malaysia in 1948, at 20%. It was raised to 30% in 1951, and to the present level of 40% in 1959.[2] In addition there is a Tin

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[1] See Tables 23 and 25.

[2] See Lim Chong Yah, Economic Development of Modern Malaya, op.cit., p.265.

Profits Tax,[1] dating from 1965[2] and a 5% Development Tax dating from 1967[3]. Thus only 20-25% of export income is left to flow abroad. The extent to which dividend payments actually do flow abroad depends mainly on the proportion of the current value of issued capital of the dredging companies which is owned by Malaysian residents (excluding resident "Europeans"). Research on local ownership has been carried out by Dr. Yip Yat Hoong of the University of Malaya[4] for Malaysian-incorporated companies. Yip's findings are elaborated,[5] and extended to include UK-incorporated companies. The results are presented in Tables 18 and 19 and in Appendix IV-7. The results for UK companies are based on a postal survey conducted in March and April 1970.

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[1] Levied on profits which exceed a standard profit of $100 a pikul of concentrates sold. See Malaysia Yearbook 1968-69, op.cit., p. 229.

[2] This is the year when it was first mentioned in company reports.

[3] AR, Bank Negara Malaysia, 1967.

[4] "Recent changes in the ownership and control of locally incorporated tin dredging companies in Malaya", Malayan Economic Review, April 1968.

[5] In particular it was necessary to change the basis of enquiry from the proportion of shares owned (which was Yip's measure) to proportion of current value of issued capital. Yip's measure in effect weighs the percentage of shares owned in each company by the number of shares issued by that company. Thus the extent of local ownership of a company with, say, 10,000 shares currently valued at $10 million is given the same weight as a company with 10,000 shares currently valued at $1 million. Naturally since current share prices reflect current and expected earnings, the flow of dividends will be much greater for the former than for the latter company.

TABLE IV - 18

OWNERSHIP OF CAPITAL IN TIN DREDGING COMPANIES, 1970

	1970 VALUE OF ISSUED CAPITAL ($ M.)	ESTIMATED PERCENTAGE OF CAPITAL HELD BY MALAYSIAN RESIDENTS
Malaysian-incorporated	208.6	56.3
UK-incorporated	265.1	20.0
Malaysian and UK-incorporated	473.8	35.1

Sources and Notes: 1) Details are given in Appendix IV - 7. Almost all non-Malaysian incorporated companies are incorporated in the UK.

TABLE IV - 19

CONFIDENCE INTERVALS FOR OWNERSHIP OF CAPITAL IN UK-INCORPORATED DREDGING COMPANIES, 1970

MINIMUM LOCAL OWNERSHIP AT 5% LEVEL OF SIGNIFICANCE	MAXIMUM LOCAL OWNERSHIP AT 5% LEVEL OF SIGNIFICANCE	ABSOLUTE MINIMUM LOCAL OWNERSHIP	ABSOLUTE MAXIMUM LOCAL OWNERSHIP
14.3%	25.7%	18.0%	28.2%

Sources and Notes: 1) See Appendix IV - 7 for details. The lower confidence limit is rendered inoperative by being lower than the absolute minimum local ownership and is shown for interest only. The absolute minimum and maximum local ownerships assume zero and 100% local ownership, respectively, in the UK companies for which data were not obtained.

From these tables it can be seen that approximately a third of the current value of dredging capital is owned in Malaysia. Thus only some 25-30% of gross profits representing about 15% of the value of gross output, flows abroad as dividend payments. Foreign tax payments are negligible.[1] Thus nearly three-quarters of dredging profits are retained in Malaysia. Tin dredging which it will be remembered represents the "foreign" sector of tin mining, is an enclave whose isolation from the domestic economy has been much reduced.[2 3]

Table 20 is a summary of local and foreign payments in dredging[4] and provides further evidence of how little isolated is the dredging "enclave". It indicates that nearly three quarters of dredging current payments are local.

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[1] Before Malaysian income tax was instituted the outflow of profits took the form of payments of U.K. company tax (now remitted under double taxation relief) rather than higher dividends.

[2] An interesting account of the breaking open of other such enclaves is in R. Vernon, "Foreign Owned Enterprise in the Developing Countries", in J.D. Theberge, Economics of Trade and Development, op.cit.

[3] Yip's research indicates a considerable rise in local ownership over the ten year period to 1964. Zorn and Leigh-Hunt suggest that the reason why many dredging company shares are no longer traded on the London Stock Exchange is that the companies are becoming increasingly locally owned and share transactions take place mainly in Malaysia and Singapore (Private communication, July 1970).

[4] 1967 rather than 1968 has been chosen to provide better comparison with the rubber estate sector (see Table V-25), for which more data are available for 1967 than 1968.

TABLE IV - 20 LOCAL AND FOREIGN PAYMENTS IN TIN DREDGING, WEST MALAYSIA, 1967

(Items as percentage of annual value of output)

	TOTAL	LOCAL	FOREIGN	UNALLOCATED
Costs				
Wages	14.8	13.3	1.5	-
Materials	13.7	8.2	-	5.5
Other Operating Costs	6.3	-	-	6.3
Depreciation	6.5	6.5	-	-
UK Expenses	1.7	-	1.7	-
Other Costs	0.5	-	-	0.5
Allocation of Gross Profits (56.5% + 4.3% 'Other Proceeds')				
Export Duty	14.7	14.7	-	-
Malaysian Tax	20.7	20.7	-	-
UK Tax	1.1	-	1.1	-
Dividends	24.4	9.1	15.3	-
Total Allocation of Export Income (including 'Other Proceeds')	104.4	72.5	19.6	12.3

Sources and Notes: 1) Wages - total from CMinI 1967. Foreign component is calculated as follows: The total number of 'other' races (i.e. other than Indians, Malays and Chinese) employed in dredging is obtained from HLS 1967, p. 10. It is assumed that this number (160) is roughly equal to the number of Europeans employed. An average monthly wage of $2000 is assumed, and the resulting annual wage bill calculated as a % of the total wage bill, (approx. 10%). 10% of the 14.8 points representing total wages as % of total gross output is taken as the shares of wages going to expatriates.

2) Materials - totals from CMinI 1967. Electricity is taken as the main local item, (57%) and this is rounded up to 60% to take account of other local purchases, 60% of the 13.7 percentage points representing materials as a % of total gross output is taken as the local material component.

3) Other operating costs - assumed on the basis of the sample of company reports to be 80% of total costs. Total costs from Zorn and Leigh-Hunt data in Table 15.

4) Depreciation and UK expenses from Table 16.

5) Export duty from Table 16.

6) Tax payments and dividends from Zorn and Leigh-Hunt data in Table 15, split between UK and Malaysian taxes on the assumption (from Table 16) that Malaysian taxes are 95% of total tax payments.

7) Dividends split between local and foreign payments on the basis of share ownership given in Table 18.

Table 21 performs a similar exercise for "other tin", which, it will be remembered, is predominantly Chinese gravel pumping. It thus represents the local sector. Virtually no profits earned by Chinese miners would be exported[1] and the only major materials import is of diesel, which has been much reduced since the domestic production of diesel oil.[2] Thus over 85% of current payments are retained.

Table 22 gives details of some major European companies included in "other tin". They produced 2.2% of "other tin" in 1967, which is approximately one fifth of the total output (10%) produced by European non-dredging companies. For these companies, profits are lower as a percentage of output than in dredging. Net profits before tax were about 30%, making approximately 45% including export duty, compared to over 60% in dredging. Dividends were about half those of dredging, and tax payments also lower. The economic structure of the European gravel pump mines would be similar to that of Chinese mines. Thus even

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[1] Tax payments by Chinese companies would be at the usual flat rate of 40% less the usual deductions for depreciation etc. Partnerships would be taxed at a progressive rate. (See Malaysia Year Book 1968-69, op.cit., p. 231).

[2] See Section 4 for a discussion of import substitution in diesel production.

TABLE IV - 21 LOCAL AND FOREIGN PAYMENTS IN 'OTHER TIN MINING', WEST MALAYSIA, 1967

(Items as percentages of annual value of output)

	TOTAL PAYMENTS	LOCAL PAYMENTS	FOREIGN PAYMENTS	UNALLOCATED PAYMENTS
1. Wages (including free food and medical expenses)	23.7	22.7	1.	-
2. Materials	23.1	12.5	3.4	7.2
3. Allocation of Gross Profits (53.2%)				
Export Duty	14.7	14.7	-	-
Foreign Dividends (maximum)	2.0	-	2.0	-
Other payments	36.5	36.5	-	-
TOTALS	100.0	86.4	6.4	7.2

Sources and Notes: 1) Wages and Materials - same methods used as for dredging. See Table 20, notes 1 and 2.
2) Gross Profits - calculated as a residual from Wages and Materials. Foreign companies controlled in 1966 approximately 10% of 'Other Tin Mining Output' according to CMinI 1966. Assuming their profits were a proportion of gross output similar to that for locally owned companies, they would have 10% of the sector's total net profits after duty (i.e. 10% of 53.2 - 14.7 = 3.85). From Table 22 it can be seen that approximately half of net profits are paid in Malaysian tax. Therefore the maximum amount which foreign companies could remit abroad if their shares were owned entirely by foreigners would be 0.5 x 3.85 = 1.9 approximately, say 2% as a maximum. Other Payments would consist mainly of Malaysian tax and dividend payments.
3) Materials - 9.6% points for Materials are Diesel, of which 6.2% points purchased locally. See Section 4. Of course this takes account only of the direct import component of materials. In the 1965 WM Interindustry Accounts 70% of the gross value of local petroleum products was imports. Taking this into account for diesel lowers the local materials and total local payments by 4.3% points. Electricity on the other hand has only a 1% import content. A full picture of the import content of tin exports could be obtained from inverting the input-output matrix, but this would not alter the conclusions reached by more than a few percentage points (unless the final demand purchases of factors employed in the industry were also taken into account.)

TABLE IV - 22 'OTHER TIN MINING' - PROFITS, TAXES, AND DIVIDEND PAYMENTS OF SELECTED 'EUROPEAN' COMPANIES, 1967

	ANNUAL VALUE OF OUTPUT ($000)	(% of Annual Value of Output) NET PROFITS	TAXES	DIVIDENDS
Gravel Pump Mines				
Gopeng Consolidated Limited	2,383	50.0	24.2	15.1
Idris Hydraulic Tin Limited	306	23.8	10.4	7.1
Chenderiang Tin Dredging Limited	195	24.9	8.2	-
Meru Tin Limited	280	6.9	4.3	2.7
Total and Means	2,969	40.6	20.1	12.3
Société des Etains de Kinta (1968)	3,326	38.9	...	...
Total and Means	6,295	34.6		
Open Cast				
Sungei Besi Mines Limited	1,402	28.4	13.1	15.3
Underground				
Pahang Consolidated Company Limited	1,904	19.6	10.1	9.5
OVERALL TOTAL AND MEANS				
a) Including Société des Etains de Kinta	9,601	30.8	...	...
b) Excluding Société des Etains de Kinta	6,274	31.8	15.6	12.1

Sources and Notes: 1) All figures from Zorn and Leigh-Hunt, op.cit., 1969 edition; except for Société des Etains de Kinta, for which data were obtained direct from the company in Paris, and Chenderiang whose data are from its 1967 annual report. 1967 figures not available for Société des Etains de Kinta.

2) Profits are shown net of 14.7% export duty.

3) The zero figure for dividends for Chenderiang is somewhat misleading as it paid dividends in most other years. Dividend payments for gravel pump mines and overall were 13.1% and 12.1%, respectively, excluding Chenderiang.

4) The companies listed above accounted for 2.2% of the 1967 'Other Tin Mining' output.

5) In spite of its name Chenderiang operates gravel pumps not dredges.

if all dividends were sent abroad,[1] over 70% of current payment would still be local.

An alternative source of information on the payments structure of tin companies is the <u>Report on the Financial Survey of Limited Companies Malaysia 1967</u>, published by the Department of Statistics. This covers all tin companies, both private and public. 31% of 1967 tin output was produced however by unincorporated businesses which are n not covered in the <u>Survey</u>.[2] Since virtually no unincorporated firms exist in the dredging sector this statistic implies that less than half of "other tin mining" output originated in firms covered by the <u>Survey</u>. Table 23 summarizes the <u>Survey's</u> findings. Foreign-controlled

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[1] The only information obtained on local shareholdings in European non-dredging companies was as follows: Chenderiang Tin Dredging were unable to quote an exact figure for local ownership, but in 1966 two companies, Asia Life Insurances Limited, and Beacon Holdings Limited, acquired 80% of the stock (Private communication April 1970). As far as the Secretary of the Societe des Etains de Kinta was aware, <u>none</u> of its shares are owned in Malaysia. (Private communication April 1970). 37% of the shares of Sungei Besi Mines Limited, the main open cast mine, were owned by residents of Malaysia (and Singapore). (Private communication, June 1971). 77% of Ralsman Hydraulic Tin Bhd's shares were owned locally (private communication, July 1970). According to the <u>Report on the Financial Survey of Limited Companies, Malaysia, 1967</u> (whose results are discussed further below), 68.1% of the par value of issued capital of locally controlled, locally-incorporated companies was in local hands (see Table 23 note 2 for definition of locally owned), and 26.9% for foreign controlled local companies (an average of 52.7% for the two types). The two categories include both incorporated gravel pumping mines and some dredges. The <u>Survey</u> gives no details of local ownership in foreign-incorporated companies (but see Table 18 above for such details).

[2] <u>CMinI</u>, 1967.

TABLE IV - 23

CURRENT PAYMENTS STRUCTURE OF PRIVATE AND PUBLIC TIN MINING COMPANIES IN MALAYSIA, 1967: SURVEY OF LIMITED COMPANIES DATA

	Items as Percentages of Annual Revenue from Sales of Goods and Services		
	(i) MALAYSIAN INCORPORATED LOCALLY CONTROLLED COMPANIES	(ii) MALAYSIAN INCORPORATED FOREIGN CONTROLLED COMPANIES	(iii) FOREIGN INCORPORATED COMPANIES
Current Profits before Direct Tax, Duty and Indirect Tax	15.2	50.1	45.5
Duty and Indirect Tax	3.8	14.8	15.1
Direct Tax	6.1	17.5	14.7
Wages and Salaries (including Contract Labour)	29.3	15.0	21.8
Purchases of Goods and Services	52.8	28.4	26.3
Depreciation and Depletion	7.4	5.2	6.8
Dividends Paid	4.2	20.2	15.7
Payments to Overseas Shareholders	0.2	13.4	...
Retained Profits	1.0	-2.4	...
Revenue other than from Current Sales	10.1	4.9	3.1
Annual Revenue from Sales of Goods and Services	$106.4m.	$91.6m.	$199.3m.

Sources and Notes: 1) All data from FSLC
2) A locally-controlled company is defined as a company with Malaysian ownership of over 50% of its voting shares. A foreign controlled company has less than 50% local ownership.
3) For foreign incorporated companies "dividends paid" are assumed in the absence of more detailed information to be equivalent to "investment income accruing to Head Office" in Appendix Table F of the Survey.
4) 'Current Profits' include 'Other Revenue'.

and foreign-incorporated firms will be predominantly dredging. Their profits, direct tax payments, and dividends are slightly lower, and labour and materials costs higher than the companies in Table 20. Malaysian-incorporated dredging companies appear to be more efficient and profitable than foreign-incorporated ones. Malaysian-incorporated, locally controlled companies will include some dredging companies.[1] Profits in this sector seem very low in comparison with the figures in Table 21. There is a strong suspicion that an error has been made in the Survey in this respect, however, since duty and indirect tax payments are listed as only 3.8% of gross revenue. Since export duty is levied at about 15%, it is likely that export duty has been included in purchases of goods and services and deducted from gross profits.

IV - 3ii 1946-63[2]

In Subsection 3i the present-day structure of current payments made out of tin export income was set out in detail. The present subsection tries to trace back the structure of these payments to the Second World War. Data for the 1946-63 period are not sufficiently complete for a proper breakdown between local and foreign payments to be made. Nevertheless any major changes in payments to inputs or government would indicate changes in the proportion of export income

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[1] In Appendix IV-7 eight locally-incorporated dredging companies are listed as having over 50% local ownership.

[2] 1963 is included because the CMinI data used for the 1963-68 do not give information on a sectoral basis for 1963.

retained in the country, and show possible changes in linkage effects, etc.

Export duty payments are available from official sources, while electricity purchases by the tin industry can be compiled from Electricity Department records. Also, enough information exists to compile a reliable series for wage payments, and slightly less reliable ones for transport charges to port and for smelting charges.[1] Table 24 summarizes dredging current payments, and Table 25 summarizes those of gravel pumping. Reference back to Table 11 provides comparison with the 1964-68 period.

In dredging wage payments have been fairly constant throughout the whole of the postwar period at about 15% of export income, though with dips in years of very high tin prices such as 1951-52 (and 1965-66).[2] Export duty payments have been constant, while electricity purchases seem to have increased somewhat. Transport and smelting charges have also altered little in importance. Thus the payments structure appears to have been constant throughout the period, in terms of factor payments and duty payments. What has changed, however, is the proportion of profits paid in taxes to the government. This was noted in the previous subsection, and is the main cause of rises in the proportion of tin dred-

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[1] The assembly of the time series used here are described in detail in appendices, references to which are given in the notes to Table 24.

[2] The relation between wage payments and export earnings in the tin and rubber industries are examined more formally in Section VII - 2 where export multipliers are calculated using time series regressions.

ging export income retained in Malaysia during the postwar period, together with increases in local holdings of dredging shares.

In contrast to dredging where the input series in Table 24 are complete in all essential respects, one major series is missing for gravel pumping - purchases of diesel oil. Of the remaining series, wage payments seem to have fallen during the 1960's in relation to earlier years. This impression is not supported though by labour coefficients shown in Table 26,[1] although the increased use of power per unit of output (Table 27) indicates a possible substitution of power use for labour use.[2] Electricity purchases have increased, reflecting an increased use of power.[3] Other input series show little change, though it is likely that diesel use, had statistics been available, would have shown increases. Increasing use of diesel would have increased foreign payments at least until the early 1960's when diesel production started locally.[4] Since few profits are remitted abroad from gravel pumping, increased government taxation of profit would have altered little the proportion of export income retained in the country.

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[1] Whereas most other time series used in this section exhibit important qualitative differences between the 1963-68, 1946-63, and 1910-39 periods, the reliability of labour and power coefficients has changed little. It has been thought proper therefore to include them in a single table shown for convenience in this (central) subsection. Coefficients for other tin sectors are shown out of interest.

[2] For an estimation of tin production functions in terms of labour and power use, see Subsection 3v.

[3] Electricity prices have been almost constant since the early 1950's. (See Appendix IV - 10).

[4] See Section 4.

TABLE IV - 24 TIN DREDGING CURRENT PAYMENTS, 1946-63

(as percentage of value of output)

	(i) VALUE OF OUTPUT ($MIL)	(ii) WAGES AND LABOUR BENEFITS	(iii) ELECTRICITY PURCHASES	(iv) TRANSPORT COSTS TO PORT	(v) SMELTING CHARGES	(vi) EXPORT DUTY	(vii) TIN PRICE ($ PER PIKUL)
1946	7.3	153.8(sic)	...	0.7	2.6	12.2	170
1947	44.8	37.9	...	0.5	2.6	14.7	218
1948	99.8	15.4	...	0.4	1.9	14.6	281
1949	131.8	14.0	...	0.3	1.9	14.7	294
1950	171.9	12.6	2.9	0.3	1.5	14.8	367
1951	256.3	9.6	2.6	0.2	1.1	15.7	527
1952	238.8	11.2	3.5	0.3	1.1	15.2	480
1953	174.8	15.4	5.0	0.3	1.5	15.1	363
1954	187.1	15.5	4.4	0.3	1.5	15.2	354
1955	190.8	15.8	4.8	0.3	1.5	14.9	363
1956	199.7	15.2	4.8	0.4	1.4	14.6	387
1957	176.2	19.9	6.2	0.4	1.5	14.7	373
1958	123.4	17.6	11.3	0.4	2.2	12.4	369
1959	125.9	15.2	9.5	0.4	2.0	14.2	397
1960	185.3	14.6	6.5	0.4	2.1	16.1	394
1961	222.5	12.8	6.7	0.3	1.8	15.4	447
1962	214.7	13.6	7.5	0.3	1.8	15.2	448
1963	210.5	15.2	7.5	0.3	1.8	15.5	445

Sources and Notes: 1) Output values calculated from outputs from Appendix IV - 2 and prices from Appendix IV - 4.

2) For details of the construction of the time series used to calculate the percentages in columns ii to v, see Appendices IV - 8 and 9 (wages and labour benefits), IV - 10 (electricity,) and IV - 11 (transport and smelting charges).

3) Export duty figures from BSMI to 1955, BSMI 1956-60, and Annual BSMI's 1961-63. Duty payments are allocated to dredging (and to gravel pumping in Table 25) according to the sector's share in total output (From Appendix IV - 2).

4) Tin prices from Appendix IV - 4.

[illegible]

TABLE IV - 25

GRAVEL PUMP MINING CURRENT PAYMENTS, 1946-63

(as percentages of value of output)

	(i) VALUE OF OUTPUT ($MIL)	(ii) WAGES AND LABOUR BENEFITS	(iii) ELECTRICITY PURCHASES	(iv) TRANSPORT COSTS	(v) SMELTING CHARGES	(vi) EXPORT DUTY	(vii) TIN PRICE ($ PER PIKUL)
1946	9.4	66.0	...	0.7	2.6	12.2	170
1947	30.8	50.6	...	0.5	2.6	14.7	218
1948	74.0	41.4	...	0.4	2.0	14.6	281
1949	91.6	33.8	...	0.4	1.9	14.7	294
1950	130.5	21.4	4.7	0.3	1.5	14.8	367
1951	167.2	25.5	4.6	0.2	1.1	15.7	527
1952	174.2	24.1	4.8	0.3	1.1	15.2	480
1953	132.9	23.7	7.1	0.3	1.5	15.1	363
1954	134.1	26.5	7.1	0.3	1.5	15.2	354
1955	147.5	22.2	7.7	0.3	1.5	14.9	363
1956	162.0	31.8	7.6	0.4	1.6	14.6	387
1957	152.8	26.0	8.5	0.4	1.5	14.7	373
1958	87.1	36.8	10.1	0.4	2.2	12.4	369
1959	92.6	19.6	9.9	0.4	2.0	14.2	397
1960	117.9	20.7	9.8	0.4	2.1	16.1	394
1961	145.1	21.2	9.3	0.3	1.8	15.5	447
1962	166.2	20.2	8.9	0.3	1.8	15.2	448
1963	182.1	20.5	8.4	0.3	1.8	15.5	445

Sources and Notes: 1) As for Table 24.

TABLE IV - 26

LABOUR COEFFICIENTS IN TIN MINING 1928-66

(Number of Workers per 10 Tons Output of Metallic Tin)

	DREDGING	GRAVEL PUMPING	HYDRAULIC	OPEN CAST	UNDER-GROUND	DULANG	ALL TIN
1928	7.6	21.3	19.4	...	16.2	67.0	...
1929	6.2	20.4	15.3	...	18.6	84.7	14.4
1930	5.0	14.6	19.9	...	16.2	80.9	12.0
1931	4.2	12.6	16.5	...	11.8	61.8	10.4
1932	5.9	15.8	31.0	...	14.1	92.4	14.7
1933	6.1	20.2	35.4	...	24.8	122.8	15.9
1934	5.3	21.0	24.6	...	17.0	127.6	14.9
1935	5.8	18.6	25.5	...	15.8	110.9	13.5
1936	5.1	17.0	15.3	...	14.5	95.8	11.0
1937	4.5	16.5	14.4	...	14.9	98.1	10.4
1938	7.0	17.4	16.3	...	14.6	94.1	11.7
1939	7.0	20.2	39.7	...	21.7	96.6	12.3
1940	39.5	29.1	48.6	...	...	107.2	27.3
1947	9.7	21.9	18.3	21.7	45.8	119.4	14.6
1948	6.9	14.5	13.8	8.8	30.3	84.0	10.5
1949	5.6	12.1	11.5	...	18.3	73.3	8.5
1950	5.5	11.2	11.3	...	13.2	75.9	8.2
1951	5.1	12.0	10.1	...	11.6	29.4	8.0
1952	5.0	10.5	11.3	11.5	12.3	73.5	7.8
1953	4.6	7.8	11.1	9.4	13.3	80.4	6.5
1954	4.4	8.4	9.6	13.4	12.9	71.3	6.5
1955	4.6	7.9	9.5	14.0	13.0	71.2	9.1
1956	4.0	7.5	9.7	12.3	14.1	70.7	6.3
1957	4.9	6.9	9.3	11.8	13.5	74.2	6.2
1958	4.8	6.6	16.6	11.2	14.2	93.6	6.0
1959	4.5	7.6	13.3	12.2	14.6	126.2	6.3
1960	4.0	7.1	10.7	13.0	11.3	82.4	5.6
1961	3.8	7.9	9.1	9.9	11.8	80.6	5.8
1962	3.8	7.4	9.3	7.8	12.2	88.5	5.7
1963	3.6	7.5	2.0	5.6	11.9	82.1	5.6
1964	4.2	8.4	9.7	10.2	12.2	78.7	6.4
1965	4.2	9.4	7.1	9.4	12.8	77.2	7.1
1966	4.5	8.8	6.8	9.6	12.8	77.9	7.1
1967	4.4	8.1	5.5	7.5	13.7	...	6.8
1968	4.6	7.5	5.7	8.3	12.6	77.6	6.5

Sources and Notes: 1) Sectoral output figures (except underground mining) from Appendix IV - 2, employment figures from Appendix IV - 3. Employment is divided by output in ten ton units. Underground figures are for the Pahang Consolidated Company only, from the Company's Sixty Years of Tin, op.cit. All tin figures from Appendix IV - 1.

2) Open Cast figures are somewhat suspect, because iron and coal (which are also mined by open cast methods) are also included in the employment figures. Iron and coal employment have been subtracted from total to estimate tin employment. No iron employment figures available for before the Second World War. There was no coal production from 1960.

3) All figures except for underground mining also include labour employed in producing minerals other than tin. No aggregate labour force figures for tin for 1928 and earlier are available.

4) Pre-war figures refer to FMS only.

TABLE IV - 27 HORSE POWER COEFFICIENTS IN TIN MINING, 1929-66

(HP per 10 tons Output)

	(i) DREDGING	(ii) GRAVEL PUMPING	(iii) HYDRAULIC	(iv) OPEN CAST	(v) UNDERGROUND	(vi) ALL TIN
1929	...	...	...	...	...	26.4
1934	25.9	49.5	...	...	...	44.9
1935	27.6	45.7	...	...	...	41.0
1938	32.3	59.2	...	...	...	...
1946	90.8	109.3	153.1	...	...	72.8
1947	40.7	96.9	86.1	...	113.8	59.7
1948	31.4	78.2	89.3	9.6	44.6	51.6
1949	27.9	76.0	87.0	...	101.8	47.8
1950	30.6	79.7	78.6	...	68.5	51.5
1951	31.1	95.7	103.8	...	58.0	55.5
1952	30.4	93.7	120.5	39.2	...	56.7
1953	33.3	83.8	95.3	50.7	9.0	54.3
1954	32.1	94.2	96.1	71.4	2.8	57.1
1955	32.9	98.5	84.7	54.0	...	59.6
1956	34.1	101.2	79.2	95.4	...	62.0
1957	38.6	97.2	78.5	104.2	18.8	64.2
1958	48.6	129.2	119.9	57.9	19.3	79.6
1959	43.0	124.0	110.9	54.2	22.8	75.1
1960	41.0	118.9	79.1	147.3	59.9	69.0
1961	38.9	134.7	67.9	137.1	57.9	73.7
1962	40.4	123.7	75.8	111.2	46.5	73.4
1963	43.7	128.1	24.3	112.4	56.2	77.2
1964	47.7	148.2	87.6	183.3	63.2	93.7
1965	49.8	173.6	89.7	171.9	65.1	110.6
1966	52.7	171.7	90.1	163.5	64.5	115.9
1967	...	...	...	...	...	...
1968	59.2	166.4	89.1	134.4	64.6	119.1

Sources and Notes: 1) HP is expressed per ten tons of output to provide comparability with the labour coefficient figures of Table IV - 30.

2) Identical methods to those used in the calculation of the labour coefficients have been used here to isolate open cast and underground tin mining from coal and iron mining. Again, only the post-1960 open cast and underground figures are reliable. In post war years, ... indicates that the method has produced a negative number.

3) 1929 HP figure from AR, Mines Department, FMS, 1930; and 1934 and 1935 from AR's Mines Department, 1934 and 35. Pre-war figures refer to FMS only. Post war HP figures are from Appendix IV - 5.

4) Output figures from Appendices IV - 1 and IV - 2.

Finally, the proportion of tin export income retained in Malaysia depends on the distribution of output between the two main sectors. Reference back to Table 3 shows that the share of dredging has declined. This would raise the proportion of export income retained locally, other things being equal, since the outflow abroad from dredging is greater than that from gravel pumping.

IV - 3iii 1910-1939

This subsection performs a similar exercise for 1910-39 to that of 3ii for 1946-63. Suprisingly there is a much wider range of input data available for this period than for 1946-63. They are however of greatly varying quality, and are available before 1928 only in aggregate form for all tin mining, or even in some cases, for mining of all minerals.

Table 28 shows for all tin mining, proportions of current payments for all input items on which data are available. Wages are calculated for each main sector separately, and aggregated for this table. No other inputs, except electricity, are available on a sectoral basis. Full details of calculations are given in the appendices cited in the table. Wages data are in no sense comparable in reliability to the post-1946 series. Separate wage figures for mining appear only after 1930, and those only for unskilled workers. In contrast, the post-1946 wages were based on averages calculated from detailed statistics. Diesel oil consumption is from Mines Department sources and may be inaccurately reported, although it is likely that the unit value figures are accurate. Local coal consumption figures may be more accurage to the extent that the

TABLE IV - 28

TIN MINING CURRENT PAYMENTS, FEDERATED MALAY STATES, 1910-39

(as percentages of value of exports)

YEAR	(i) VALUE OF EXPORTS ($ MIL)	(ii) WAGE BILL	(iii) DIESEL OIL	(iv) LOCAL COAL	(v) FOREIGN COAL	(vi) FIRE-WOOD	(vii) ELECT-RICITY	(viii) SMELTING CHARGES	(ix) TRANSPORT COSTS TO PORT	(x) TRANSPORT COSTS FOR FUEL	(xi) EXPORT DUTY	(xii) TOTAL COSTS (ii TO x)	(xiii) TIN PRICE ($ PER PIKUL)
1910	57.1	...	...	-	...	...	-	...	...	...	12.5	...	78
11	69.7	...	...	-	...	...	-	...	...	...	12.6	...	94
12	84.1	...	...	-	...	...	-	...	...	...	12.9	...	103
13	83.6	37.2	...	-	...	1.0	-	3.6	...	0.5	12.8	(42.3)	100
14	60.7	39.0	...	-	...	2.2	-	5.7	...	1.0	11.6	(47.9)	73
15	61.4	36.2	...	0.1	0.8	2.4	-	4.1	...	1.0	11.8	(44.6)	78
16	64.5	31.0	...	0.3	1.3	2.8	-	3.0	0.3	1.3	12.2	40.0	86
17	72.8	23.0	...	0.3	1.5	2.8	-	5.4	0.3	1.2	12.8	34.5	109
18	94.5	22.3	...	0.5	-	3.2	-	4.1	0.2	1.0	13.9	31.3	151
19	74.9	22.0	...	0.8	0.1	4.2	-	3.7	0.3	1.4	13.3	32.5	121
1920	88.4	12.0	...	1.1	-	4.6	-	3.4	0.2	1.3	13.8	22.6	151
21	49.3	21.1	...	1.7	0.7	7.8	-	5.5	0.5	2.9	12.5	40.2	85
22	47.8	23.6	...	1.2	1.5	7.0	-	5.9	0.5	2.9	12.1	42.6	81
23	64.3	23.2	...	1.2	1.3	5.4	-	5.7	0.4	2.3	12.8	39.5	102
24	91.9	17.9	...	1.1	0.3	4.6	-	3.0	0.3	2.3	13.7	29.5	124
25	101.7	16.3	1.2	1.2	0.4	6.1	-	2.5	0.4	3.0	13.8	31.1	132
26	111.6	25.0	1.4	1.4	-	3.6	-	1.6	0.3	2.0	14.0	35.3	145
27	127.6	16.7	2.0	1.3	0.4	2.6	-	1.7	0.3	1.9	14.0	26.9	145
28	118.8	11.9	2.7	1.5	0.2	1.8	0.8	1.8	0.4	1.7	13.5	22.8	114
29	117.5	15.6	3.1	1.5	0.1	1.6	1.0	1.4	0.4	1.8	13.6	26.5	104
1930	75.0	14.8	4.2	1.6	0.3	1.6	2.3	3.9	0.5	2.2	12.0	21.4	73
31	51.1	11.1	3.6	1.8	-	1.6	...	5.3	0.6	2.1	10.8	(26.1)	60
32	31.3	13.8	3.5	1.3	0.1	1.8	...	2.2	0.6	1.9	11.5	(25.2)	70
33	37.7	18.9	2.2	0.7	-	1.2	...	1.7	0.6	1.1	13.0	(26.4)	100
34	67.5	15.5	1.7	0.6	-	0.8	...	...	0.2	1.0	13.2	(19.8)	114
35	76.2	15.6	1.8	0.7	-	0.6	...	...	0.3	1.0	12.7	(20.0)	111
36	109.4	14.0	...	0.8	-	...	6.2	...	0.4	...	12.2	(21.4)	100
37	151.4	18.5	2.7	0.8	0.9	0.6	5.2	...	0.4	1.4	12.9	30.5	120
38	64.3	14.6	4.4	1.4	0.5	1.0	7.6	...	0.5	1.7	12.6	31.7	95
39	100.2	18.3	...	0.7	-	...	3.9	...	0.4	...	13.1	(23.3)	114

TABLE IV - 28 (CONTINUED)

Sources and Notes: 1) Column i from BSMI to 31 December 1955. Export figures used for whole period because production figures are available for 1931-8 only.
2) Sources and methods for other columns can be found in the following Appendices: ii in IV - 12, iii, iv, v, vi and vii in IV - 13; and viii, ix and x in IV - 14.
3) Export duty figures calculated from Fermor, *op.cit.*, p. 88.
4) Bracketed items in column xii indicate that certain input items are not available for those years. Purchases of diesel are unimportant to 1924.
5) Tin prices from Appendix IV - 4.

Mines Department had access to Malayan collieries' sales records. Foreign coal consumption is calculated as a residual after local coal mining purchases are subtracted from mining coal consumption. The firewood tonnage figures, also from the Mines Department, are only rough estimates. The unit value figures (not given by the Mines Department) have been estimated on heroic but (it is hoped) plausible assumptions, and the tonnage figures are somewhat suspect.

The proportion of wages falls from 1913 to the 1920's, reflecting the decline of open cast mining.[1] Growth of diesel consumption to the 1929 boom, probably reflecting use by Chinese mines, can be seen. The lack of diesel figures before 1925 is unimportant since the tonnage in 1924 and earlier was very small.[2]

It is interesting to see the growth in consumption of both local coal and firewood from 1915. Firewood reached a peak in the early 1920's as dredge production and therefore consumption of firewood[3] rose, and then fell as dredges switched to coal in the late 1920's. Again, coal consumption declines in the 1930's as dredges switched to electricity.

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[1] Of course proportions of input receipts in gross payments can change for cyclical as well as secular reasons. However, correlating the tin price as a rough indicator of the cyclical factors, and the proportions of wages in output, shows no significant association. The correlation coefficient for 1910-39 is -0.21. Lagging wages one year behind prices lowers the correlation to -0.07. Fluctuations in the wages proportion were larger than those of the tin price. The standard deviation of tin prices was 23.6% of mean tin price, compared to 37.1% for the wage proportion.

[2] 1913-24 tonnage figures are given in Appendix IV - 13. Unit value figures were not available for those years.

[3] See Section 2 for a discussion of fuels used in dredging.

Export duty remained constant at the 10-15% level. Separate figures are shown for fuel transport costs, as coal unit value figures are given ex-pithead and imported fuel values given c.i.f. at port of entry.

The large drop in output in the early 1930's reflects the Depression and tin restriction.[1]

Separate output figures by sector are available from 1928. Table 29 shows these for dredging and gravel pumping. Wages and electricity figures are on a sectoral basis. Fuel consumption cannot be allocated between sectors according to output (or at least, the result would be trivial) and transport and smelting charges, and export duty, would be the same percentages as in Table 28. The figures show contrasts in labour intensity between the sectors. The large difference in electricity consumption is in contrast to the postwar experience where the two sectors consumed similar amounts of electricity as proportions of output. Presumably this reflects the fact that many dredges were still solid fuels, and many Chinese mines had not switched to diesel.

Compared to the 1946-63 period, dredging is much less labour intensive, with an unweighted mean labour proportion of 8% for 1928-39 compared to 14% for most of the postwar period. Similarly, the labour coefficient (from Table 26) for 1930-39 is 5.6, which is higher than for the postwar period from 1950. However, the coefficient may be higher because of the restriction of tin output during the 1930's, when labour inputs were reduced by reducing wages as well as employment. For gravel pumping the mean labour proportion is 19.4%, similar to that

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[1] See Appendix IV - 15 for a discussion of tin restriction.

TABLE IV - 29 TIN MINING CURRENT PAYMENTS BY SECTOR, FMS, 1928-39
(as percentage of value of exports)

	DREDGING			GRAVEL PUMPING		
	(i) VALUE OF OUTPUT ($000)	(ii) WAGES	(iii) ELECTRICITY	(iv) VALUE OF OUTPUT ($000)	(v) WAGES AND FREE FOOD	(vi) ELECTRICITY
1928	35,822	8.9	...	53,436	19.6	...
29	47,543	8.0	...	50,723	20.5	...
1930	30,326	7.3	...	34,607	16.7	...
31	22,245	5.6	...	20,557	12.3	...
32	13,958	6.8	...	12,321	13.3	...
33	18,075	8.1	...	14,638	20.7	...
34	32,740	7.3	...	26,236	21.3	...
35	34,129	8.1	...	31,125	19.4	...
36	51,164	8.0	...	41,719	19.7	...
37	72,893	9.6	3.3	57,883	26.7	9.4
38	29,588	10.1	...	25,172	15.7	...
39	45,088	12.6	...	34,573	27.3	...

Sources and Notes: 1) Calculated from Appendices IV - 12, and 13.

TABLE IV - 30 COST STRUCTURE OF EIGHT TIN DREDGING COMPANIES, 1915-16

MINE COSTS	% OF TOTAL COSTS	HEAD OFFICE COSTS	% OF TOTAL COSTS
Management Salaries	20.3	Directors' Fees	2.0
Local Labour	20.2	Commissions	0.7
Fuel	20.4	Secretarial and other Expenditure	0.9
Stores	2.7	Cables and Legal and Sundry Expenditure	2.7
Repairs and Upkeep	10.0		
Transport	0.8	Sub Total	6.3
Prospecting	3.6	Depreciation	11.7
Ore Dressing	3.9		
Sub Total	81.9	Mean operating cost per cubic yard	12¢

Sources and Notes: 1) Calculated from figures in H.D. Griffiths, Bucket Dredging for Tin in the FMS, op.cit., p. 21. Mean cost figure per cubic yard is from ibid., p. 20. Since mine costs are 81-9% of total costs, total operating costs per cubic yard will be approximately 14.6¢, say 15¢ approximately.
2) The companies are Malayan Tin, Ipoh Tin, Kampong Kamunting Tin, Kamunting, Chenderiang, Tekka, Thaiping, and Tronoh.

of 1960-67. The labour coefficient is 17.4, substantially higher than in the postwar. This suggests a relative improvement in the quality of the gravel pump labour force (or at least an increase in the real wage).

Table 28 specifies most main inputs. Total costs for 1916 are 40% of output. By 1926 this is 35.3%, and by 1938 32.9% (assuming smelting charges to have remained constant at 1.7%). This compares to 33.1% in 1963, and 38.8% in 1968,[1] when gravel pumping output was again becoming more important than dredging. Thus the basic cost structure seems to have changed little since the 1920's, and it is again clear that the main determinant of the flow of payments into or out of the domestic economy is the distribution of profits. 10-15% points were retained by means of export duty. At least half of the rest[2] would have been remitted abroad as foreign tax or dividend payments.

Dredge inputs may also be compared to the costs shown in Table 30. Griffiths, from whom these figures are taken, cites an average recovery rate of 0.6 katis per cubic yard for these dredges.[3] At the price of $78 per pikul of metallic tin in 1915[4] the gross revenue per cubic yard would be $0.35.[5] Griffiths mean cost figure of 15¢ per cubic yard

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[1] See Table 11.

[2] This is a rough estimate of the proportion of total tin industry profits accruing to "European" mines.

[3] Op.cit., p. 3.

[4] From Appendix IV - 4.

[5] $78 per pikul metallic tin = $58.5 per pikul ore (containing 75% tin). At $58.5 per pikul, 0.6 katis are worth 35¢. At that time virtually all dredging shares would have been foreign-owned.

TABLE IV - 31

PAYMENTS STRUCTURE OF SELECTED DREDGING COMPANIES IN SELECTED YEARS, 1911-39

(Items as Percentages of Gross Proceeds for Sales of Tin Ore)

	TOTAL COSTS	OPERATING COSTS	DEPRECIATION	EXPORT DUTY	LONDON EXPENSES	NET DIVIDENDS	TAX
1911							
Pengkalan	77.7	74.5	...	...	...	...	...
1920							
Kamunting	54.9	40.7	10.0	...	4.2	15.7	8.0
1925							
Kamunting	40.5	28.6	...	...	1.9	20.3g.	9.6
1930							
Pengkalan	65.7	46.7	12.1	12.3	3.1	18.2g.	3.6
Kamunting	...	50.4	18.2	...	3.4	...	4.8
Ayer Hitam	60.8	39.2	13.9	...	3.0	4.9	3.0
1935							
Kamunting	24.0	21.3	13.6	...	2.7	14.8	11.0
Ayer Hitam	38.4	23.8	11.4	...	3.1	34.7g.	...
Killinghall	57.6	23.7	8.8	14.7	34.7	15.0g.	...
1939							
Kamunting	66.3	35.4	27.9	...	2.9	1.0	15.5
Ayer Hitam	77.3	43.4	3.0	11.6	3.9	14.1g.	23.5

Sources and Notes: 1) For full names of companies see Appendix IV - 6(a).
2) All data from these companies' annual reports from Companies Registration Office, London. All the annual reports of the companies in the sample described in Appendix IV - 6 were searched for the years listed above. In many cases the profit and loss section of the balance sheet was not shown and in other cases the reports were not available.
3) Dividends marged g are gross not net.
4) Tax is U.K. tax.

means that over 55% of the value of gross output is profit. Reports for other companies in the sample were available in fact, but their profits and loss accounts were not shown in the reports. Apart from the 10-15% points export duty virtually all of this would have been remitted abroad, either as tax or dividends.[1] Also, Griffiths' figures can be compared with the payments structure of the dredging companies shown in Table 31. These are all the companies of the 1963-68 sample whose reports were available for the prewar period. Great variations are apparent in their cost structure, which makes averaging less useful than showing the original data.

IV - 3iv 1870-1910

Input series of the sort used for later years are not available, and therefore qualitative material must be relied on. An excellent economic history of Malayan tin mining to 1914 has already been written

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[1] As late as 1954, over 77% of shares in even the locally-registered dredging companies were foreign owned. See Yip, "Recent Changes in Ownership and Control", op.cit., p. 83. A change in weighting to account for current share values would not change this appreciably, if experience with the 1964 data can be relied on.

by Wong Lin Ken.[1] There is also a more general history of the industry by Yip Yat Hoong.[2] This section does not attempt to duplicate their efforts but tries briefly to extract information of a similar sort to that assembled already for later years.

As outlined in Section 1, the period saw the development of the tin industry on a large scale. Most mining was by open cast methods, with some hydraulic and underground workings. European companies operated but they were in a minority: in 1910 they produced only 22% of FMS output.[3]

In a typical open cast mine operating with little or no machinery, payments to labour would comprise over 80% of costs.[4] However, the concept of a distribution of earnings between labour and profits is somewhat artificial. As late as 1912 over 50% of workers in the FMS tin industry were employed on tribute.[5] These workers 'advanced' their labour to the mine owner for a share in the profits. Non-labour payments would have been for timber, and firewood or charcoal for smelting and as fuel for steam engines.

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[1] The Malayan Tin Industry to 1914, with Special Reference to the States of Perak Selangor, Negri Sembelan, and Pahang, op.cit. This is the published version of a Ph.D thesis submitted to the University of London in 1959.

[2] "The Development of the Tin Mining Industry of Malaya" (University of Malaya Ph.D thesis, 1967). This was published by Oxford University Press, under the same title, in 1970.

[3] Table 7.

[4] This information is from a contemporary source: R. Stokes, Malay Tin Fields (Singapore 1906), cited by Yip Yat Hoong. "Tin Export Earnings and the Early Economic Growth of Malaya". Kajian Ekonomi Malaysia, December 1966, p. 29.

[5] A further 16% only were employed directly for wages, and another 29% were employed through labour contracts. By 1920 only a quarter of workers were on tribute (AR, Mines Department, FMS, 1912, and 1920).

It is thought that the capital for Chinese mining came mainly from within Malaya itself, especially from Chinese traders in the Straits Settlements,[1] and was mainly in the form of advances of working capital[2].

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[1] Wong, op.cit., p. 64. Only in Negri Sembilan did a large part of the capital come directly from China.

[2] Capital was principally working capital. Wong (p. 67) estimates that to set up a very large mine of 600 coolies in 1880 a fixed capital investment of $4,272 was needed, of which 30% was for buildings, 15% for drainage and mining equipment, 12% for ore-dressing and smelting apparatus, and 43% for collecting and importing labour. By itself this figure is of little significance (in any case its accuracy must be spurious) - Wong simply observes that it is very small. A meaningful comparison can be made between this expenditure and operating costs. P. Doyle, Tin Mining in Larut, (London 1879), p. 10, states that mining wages at about this time were $6 to $8 a month. 600 men at $8 a month would earn $57,600 a year, giving an extraordinarily small capital value-added ratio of 0.07 (assuming that profits were distributed as 'tribute' wages). Even halving this wage rate would make little difference. Wong also notes (p. 67) that $4,272 was approximately the cost of a steam pump, the main piece of mining machinery at that time. Hence even with a steam pump, the fixed capital output ratio would be very small, (even if a number of pumps were needed for such a large mine). A large amount of working capital was required because ore was often sold only once or twice a year. However, wages were often only paid at the same intervals. Profits were increased by advancing wages and charging higher than market prices for goods purchased with advances.

Hence there would have been little outflow of profit, and much of the profit is likely to have been reinvested.[1]

A larger outflow would have been personal remittances by labourers back to China. Most workers came without their families, and many returned to China after accumulating a certain cash sum.[2]

However, to see the effects of the tin industry on Malayan development to 1910 in terms of the structures of its current payments is to take too narrow a view. During that period immigration provided a large population increase, which, combined with urbanization made for a substantial rise in the potential domestic market. Railways and roads were built, initially to service the tin industry but soon to develop the country.[3] Tin provided a major source of market orientated economic activity in a subsistence economy, although direct participation by local Malay people had to wait until the spread of 'European' mining.

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1 Yip "Tin Export Earnings", op.cit., p. 31.

2 Ibid., p. 31.

3 See Section 4 for a discussion of the interrelations of tin and railways.

IV - 3v Production Functions of Gravel Pump Tin Mining and Tin Dredging, 1947-66 [1]

An alternative method of analysis of the input structure of the two tin sectors is the use of multiple regression analysis to estimate their production functions.

The series used are physical output in tons regressed on the number of workers employed and the input of power, measured in terms of the horse-power of equipment used. Since most material inputs are fuel, the power statistics reflect materials purchases. A more interesting role for the power statistics would be as a proxy for the flow of capital services. Within an individual sector, increases in power inputs per unit of output may reflect increasing capital intensity, but the relative level of power use between the sectors is not associated with differences in capital intensity. Gravel pumping is a relatively inefficient user of power. In 1966 horse-power per worker was 11.6 in dredging and 14.0 in gravel pumping, while value-added per worker was approximately $16,000 and $6,000, respectively.[2] Thus dredging had lower power use but much greater capital intensity.

Only in the period after the Second World War are there sufficiently long series of output, employment and horse-power use split by sectors

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[1] I am indebted to Miss D. Wyatt, Statistical Assistant in the School of Social Studies at the University of East Anglia, for programming the regressions for me on the University computer.

[2] Horse-power and employment statistics are from Appendices IV - 5 and IV - 3 respectively. Value-added data calculated from CMinI 1966.

to calculate regressions.[1] Within the 1947-66 period no major structural changes occurred in either sector. In view of the dislocation caused by the Second World War and the occupation by the Japanese, it was not thought suitable to include the available pre-war data in the series.

The relationship calculated is a Cobb-Douglas production function:[2]

1) $y_t = Ae^{at} x_{1t}^{b1} x_{2t}^{b2} ut$, in first difference form:

1a) $$\frac{y_t}{y_{t-1}} = e^a \left[\frac{x_{1_t}}{x_{1_{t-1}}}\right]^{b_1} \left[\frac{x_{2_t}}{x_{2_{t-1}}}\right]^{b_2} V$$

which in log-linear form becomes:

1b) $$\log y_t - \log y_{t-1} = a + b_1(\log x_{1_t} - \log x_{1_{t-1}})$$

$$+ b_2(\log x_{2_t} - \log x_{2_{t-1}}) + \log V$$

where $\underline{y}$ is tin output in tons, x_1 is the number of workers employed, x_2 is the total horse-power employed, $\underline{e}$ (in equation 1) is the base of natural logarithms and e^{at} an exponential time trend, $\underline{ut}$ is a random disturbance term, the $\underline{t}$ subscripts indicate time in years, and the logs are natural logarithms. The exponent $\underline{a}$ in equation 1 (which becomes the constant $\underline{a}$ in equation 1a) is a measure of neutral technical progress[3]

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[1] In particular, serial correlation cannot be tested using the Durbin-Watson statistic unless there are at least fifteen observations. See E. Malinvaud, Statistical Methods of Econometrics (Amsterdam, 1966) p. 424.

[2] For a survey of the literature on production functions see A.A. Walters, "Production and Cost Functions: An Economic Survey", Econometrica, January-April 1963. This includes discussions of both Cobb-Douglas and of "SMAC" production functions (discussed below).

[3] The neutral technical progress built into the function is of the Hicksian type, which does not alter the factor-use ratio with given factor prices. See R.G.D. Allen, Macro-Economic Theory. A Mathematical Treatment (London 1967)pp. 239-240. See also Walters, op.cit., pp. 24-25.

expressed as an annual proportion,[1 2] and $V = \frac{u_t}{u_{t-1}}$. The Cobb-Douglas form was chosen because it is one of the most widely known production functions, and has been applied extensively to time seried data.[3] First

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[1] For example, an a of 0.02 indicates an annual increase of 2% in (the time path of) output, unrelated directly to increases in (the time path of) factor inputs.

[2] That a is a measure of technical progress can be shown as follows. Consider a Cobb-Douglas production function:

i) $y_t = Ae^{at} x_{1_t}^{b_1} x_{2_t}^{b_2} u_t$, where the terms are as described above.

Divide this function by the same function in the previous period (t-1): Thus:

$$\text{ii)} \quad \frac{y_t}{y_{t-1}} = \frac{e^{at}}{e^{at-1}} \cdot \frac{x_{1_t}^{b_1} \, x_{2_t}^{b_2} \, u_t}{x_{1_{t-1}}^{b_1} \, x_{2_{t-1}}^{b_2} \, u_{t-1}}$$

Consider the expression

$$\frac{e^{at}}{e^{at-1}}.$$

The denominator can be rewritten as e^{at-a}. Substituting e^{at-a} into the expression gives:

$$\frac{e^{at}}{e^{at}e^{-a}} = \frac{1}{e^{-a}} = e^{a}$$

Equation ii can be rewritten as

$$\text{iia)} \quad \frac{y_t}{y_{t-1}} = e^{a}\left[\frac{x_{1_t}}{x_{1_{t-1}}}\right]^{b_1} \left[\frac{x_{2_t}}{x_{2t-1}}\right]^{b_2} V$$

, which is equation 2 in the text, where the exponent a indicates the time trend.

I am indebted for this proof to Mr. A. Parikh of the University of East Anglia.

[3] See Walters, op.cit., pp. 22-28. An alternative is the newer "SMAC" (Solow-Minhas-Arrow-Chenery) production function. Since Cobb-Douglas assumes unitary elasticity of substitution between the inputs (which SMAC, for example, does not), an indication that the elasticity of substitution is in fact unity (or near to unity) is necessary before Cobb-Douglas can be accepted as the appropriate function to estimate. An attempt to calculate this elasticity in the two tin sectors is made in Appendix IV - 16. The attempt indicates that the elasticity of substitution in gravel pumping is (statistically) not significantly different from unity. The dredging elasticity is also near to unity (-1.25) though there is a possibility that the difference from unity is significant. Since the Cobb-Douglas results in Table 32 are both statistically acceptable and economically meaningful, no other form of function was sought.

TABLE IV - 32 PRODUCTION FUNCTIONS IN GRAVEL PUMP TIN MINING AND TIN DREDGING, 1947-66

			Regression Coefficients		
			a	b_1	b_2
Gravel Pump Mining	y^1	=	−0.03260	+ 0.13945x'_1	+ 0.98671*x'_2
			(−0.75854)	(0.49606)	(2.66640)
	R^2	=	0.69923,	DW =	1.96015*
Dredging	y^1	=	0.00949	+ 0.83646*x'_1	+ 0.63794*x'_2
			(0.38556)	(3.00239)	(2.15183)
	R^2	=	0.82751,	DW =	1.31177

Sources and Notes: 1) y is tin output in tons, x_1 is employment, and x_2 is horse-power, while a is a time trend

$$y' = (\log y_t - \log y_{t-1}) \text{ (proportionate change in output)}$$

$$x'_1 = (\log x_t - \log x_{t-1}) \text{ (" " " labour input)}$$

$$x'_2 = (\log x_{2t} - \log x_{2t-1}) \text{ (" " " power input)}$$

2) Output, employment, and power series from Appendices IV - 2, IV - 3 and IV - 5 respectively.
3) Regressions run on University of East Anglia ICT 1905E computer using REGX programme. For details of programme see L.J. Slater, Fortram Programs for Economists (Cambridge 1967).
4) The Student t statistics are shown in brackets under the values of the coefficients. Starred coefficients are those which are significant at the 5% level. A starred DW statistic indicates that there is neither positive nor negative serial correlation at the 5% level of significance.

differences[1] (of logs) are used because calculations from data in the original (logged) form[2] were found to be subject to serial correlation. Equation 1a relates the time path of output to the time paths of inputs. Results of the regressions are set out in Table 32.

In gravel pump mining the regression shows a negative time trend, and power-intensive production methods. However, neither the time trend (a) nor the labour coefficient (b_1) is significant at even the 20% level.[3] The power coefficient is significant at the 5% level and suggests a close connection between output and power inputs.[4] The *a priori* data in Subsection 3i suggest that power is a suitable proxy for materials inputs in the sector. The R^2 of nearly 0.7 is quite high, but not as high as in dredging. The Durbin-Watson (DW) statistic

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[1] The use of first differences is a standard procedure to remove serial correlation, and one which works in most cases. See K.A. Fox, *Intermediate Economic Statistics* (New York, 1968), 199. Since first differences in this case did remove most traces of serial correlation, no further transformation was sought. Further transformations would have reduced the economic meaning of the function. See J. Johnson, *Econometric Methods* (New York, 1963), p. 187 (in International Student Edition). Serial correlation occurs when the residuals are not randomly distributed. It artificially lowers the standard errors, though it does not bais the value of the coefficients a, b_1 and b_2. See *ibid.*, p. 179.

[2] These calculations are not shown here.

[3] That is to say that there is more than a 20% probability that a *t* distribution of all sample means of, for example, the b_1 coefficient, with a oopulation mean b_1 of zero, would include the calculated value of b_1. The critical values of *t* with 16 (i.e. 19-3) degrees of freedom are 1.337 and 2.120 at the 20% and 5% levels of significance, respectively.

[4] Thus a 1% rise in x_2* (the time path of power inputs) would increase y* (the time path of output) by 0.99% approximately.

indicates there is neither positive nor negative serial correlation.[1] In dredging the slight positive time trend is not significant even at the 20% level. Both labour and power coefficients, however, are significant at the 5% level. The DW statistic indicates that while there is no negative serial correlation, there is a possibility but no certainty of positive serial correlation. Dredging is shown to be labour intensive (relative to the inputs of power) and to exhibit substantial increasing returns to scale (the b_1 and b_2 coefficients sum to nearly 1.5) in contrast to the approximately constant returns in gravel pumping. There is no way of determining from the data whether dredging's increasing returns results from economies internal or external to the individual firms. However a priori information suggests that it reflects internal economies, since dredging output has been increased largely by the construction of new large-capacity dredges.[2]

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[1] With 20 observations and two independent variables a DW statistic above 1.54 would indicate a probability of positive serial correlation at the 5% level. A possibility of serial correlation would exist if DW lies between 1.10 and 1.54, and a (95%) probability if DW is below 1.10. The source used here for these limits (Malinvaud, op.cit., p. 424) gives no intermediate values between 15 and 20 observations. For the Table 32 DW's no difficulty arises in using the limits for 20 rather than 19 observations. Negative serial correlation exists in the 20 observations, two independent variable case if 4-DW is less than 1.54 (ibid., p. 425).

[2] According to the 1965 Dredge Data Chart of the States of Malaya, most dredges built before 1946 were of 200-300,000 cubic yards monthly capacity, whereas many new dredges built since then have had a monthly capacity of well over half a million cubic yards.

Thus the results depict dredging as a less materials-intensive sector, while gravel pumping has obtained its output increases largely by increasing power (and thereby capital) inputs. It should be noted, however, that while output in the tin industry is homogeneous, inputs are not. In particular, labour in dredging is of higher quality than in gravel pumping,[1] and power is consumed in dredging by much larger (and presumably more technically efficient) equipment.

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[1] Average wages in dredging have been consistently higher than in gravel pumping over the period covered. (See Appendix IV - 8). Thus the regressions underestimate the labour input in dredging relative to gravel pumping (and thereby overestimate the dredging labour coefficient). The dredging power use coefficient may similarly be slightly overestimated, thus reducing somewhat the apparent economies of scale in dredging.

Section IV - 4 Linkage Effects of Tin

This section examines the linkage effects generated by the tin industry through its intermediate purchases of inputs. The methods used are those set out in Chapter III.

IV - 4i Backward Linkages

Reference back to Table 14 shows the materials purchased by the tin industry. Electricity and diesel oil are the most important, at nearly $51 million and $45 million, respectively, in 1968. Adding all other petroleum-type products (diesel, kerosene, petrol, and lubricating oil and grease) gives a total petroleum product use of nearly $53 million. Only two other inputs are of importance: timber (other than timber for fuel), and iron castings, the demand for both of which comes mainly from the non-dredging sector. Both are semi-capital items. Timber is mainly for repair and construction of palongs and other wooden equipment. Castings consist of liners for gravel pumps,[1] spare monitors, and other parts. Coal, an important input before the Second World War, and railway services, are also discussed.

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[1] About 5% of current costs of a typical gravel pump mine of 20,000 monthly yardage would consist of spare parts for engines and pumps. (Information based on personal visits in 1969). The lining of a gravel pump is especially subject to heavy wear.

TABLE IV - 33 INTERINDUSTRY PURCHASES OF THE MINING INDUSTRY, WEST MALAYSIA, 1965

	($MIL)	PERCENTAGE OF ANNUAL VALUE OF OUTPUT
Forestry	0.8	0.1
Products of Petroleum and Coal	14.1	1.6
Electricity and Water	41.7	4.7
Wholesale and Retail Trade	29.8	3.3
Imports		
Chemical Products	1.2	0.1
Manufacture of Petroleum Products	9.0	1.0
Basic Metal Industries	8.3	0.9
Unspecified	34.4	3.8
Primary Factors		
Salaries and Wages	166.8	18.6)
Entrepreneurial Income	431.0	48.2)84.4
Indirect Taxes	157.4	17.6)
TOTAL	894.5	99.9

Sources and Notes: 1) From WM, Interindustry Accounts, 1965.
2) 1965 tin output (from CMinI, 1965) was 79.8% of the value of all 1965 mining output.

Petroleum products were entirely imported until 1963. In 1963-4 two oil refineries were established (Esso and Shell, both at Port Dickson in Negri Sembilan). Information on the economic structure of these refineries is difficult to obtain directly from official sources. They are not listed separately in the West Malaysian Census of Manufacturing, but are included only under 'All Other Industries'. Both refineries have "Pioneer" status.[1] Diesel fuel, gas oil, gasoline, industrial diesel oil, etc., are cited in the 1968 CManI list of products manufactured by Pioneer establishments. Table 34 shows that net imports of diesel for all years from 1964 were less than total tin mining diesel consumption. Hence some import substitution clearly must have occurred, especially since tin is only one of a number of industrial consumers of diesel. This impression is confirmed by the 1965 West Malaysian, Inter-industry Accounts, shown in Table 33. These show that in 1965 the Malaysian mining industry as a whole purchased $14.1 million of local petroleum products and imported a further $9 million (including coal imports, but use of coal by mines is negligible). This total of petroleum products purchases ($23.1 million) is less than that given in Table 34 for tin mining's diesel consumption ($31.2 million) but the "unspecified" mining purchases in the Accounts amount to $34.4 million. Mining purchases of petroleum products, as shown in the 1965 input-output table (not included in Table 33) were 10% of total petroleum output, and Mining was the largest single consumer, followed by Transport

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[1] Under the Pioneer Industries (Relief from Income Tax) Ordinance of 1958 new industries can have freedom from company taxation for up to five years, together with certain other priviledges. Tariff protection is often granted also. The Ordinance was revised and extended by the 1968 Investment Incentives Act, which includes export incentives and accelerated depreciation allowances.

TABLE IV - 34 WEST MALAYSIAN IMPORTS, PRODUCTION, AND TIN MINING CONSUMPTION OF DIESEL OIL, 1959-68

($000)	(i) NET IMPORTS OF HIGH SPEED DIESEL	(ii) NET IMPORTS OF OTHER DIESEL	(iii) NET IMPORTS OF ALL DIESEL	(iv) LOCAL PRODUCTION OF PETROLEUM PRODUCTS	(v) TIN MINING PURCHASES OF DIESEL
1959	20,989	10,843	31,832	-	...
1960	28,440	14,791	43,231	-	...
1961	30,829	10,166	40,995	-	...
1962	35,922	9,252	45,174	-	...
1963	33,670	7,141	40,811	*41,700	...
1964	17,061	-3,061	14,000	*91,700	23,170
1965	18,732	-3.521	15,211	137,700	31,205
1966	25,895	-2,796	23,099	*158,500	39,035
1967	24,777	- 872	23,905	...	44,565
1968	25,771	268	26,039	...	43,891

Sources and Notes: 1) Column i and ii from ASET FM/WM, 1959-68. Column iii = Column i + column ii. 1965 entry in column iv from WM, Interindustry Accounts 1965. 1963, 64, 66, entries estimated on assumption that 1965 ratio of gross to net output (4.17) from the input-output table holds for these years. Net output figures from WM, National Accounts, 1960-66. In both the national accounts and input-output tables the industry is listed as 'Products of Petroleum and Coal'. In fact there was no coal production after 1960. Column v is from Table 14.

2) Net imports = Imports - Exports (including re-exports).

3) In Column ii a minus sign indicates net exports.

4) Figures which show trade of FM/WM separately are not available before 1959.

and Communications (8%), and Electricity and Water (5%). 33% of West Malaysian petroleum output was exported in 1965.

Value-added (Primary Factors of Production) in Petroleum production was 24% of gross output in 1965. Salaries and wages constituted only 3 percentage points and entrepreneurial income 21.[1]

This proportion is high for a processing industry - value-added in rubber processing is 10%, of which wages and salaries are just under half - but it is what would be expected of a highly capitalised industry such as oil refining.

Further information on petroleum refining is to be had indirectly from the 1968 Census of Manufacturing. Both refineries are in Negri Sembilan and both have Pioneer status, and the CManI gives Pioneer company statistics by state. Since in Negri Sembilan only three Pioneer firms exist, the CManI figures will give a good indication of the petroleum industry's economic structure. For the three Negri Sembilan Pioneer firms, non-wage value-added per head was the exceptionally high figure of $100,000, while average monthly wages were nearly $1,000, indicating use of very high quality labour.[2] Total employment, however, was only 404.

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[1] For the economy as a whole value-added was 54.2% of gross output. Wages and salaries were 41.9% of total value-added (excluding indirect taxation) and entrepreneurial income 58.1%. The latter figures change to 45.6% and 54.4% respectively if agriculture and rubber growing (where peasant and smallholder income is counted as entrepreneurial) are omitted. These figures contrast sharply with labour's 12% share in Petroleum value-added.

[2] Pioneer industries can be taken as representing a standard of modern industry, against which the capital intensity (measured here by non-wage value-added per worker) can be judged. In the CManI 1968, non-wage value-added per head was $9,493 per year, and monthly wages were $233. The figures for all industries covered in the CManI 1968 were $5,024 and $184, respectively.

It is difficult to conceive of the local manufacture of petroleum products purely as a linkage of tin, or even as a tin industry linkage induced by government policy promoting foreign investment.[1] However, the existence of such a large consumer must have played a part in establishing the minimum size of market required for at least the first refinery.

Electricity for the mining is almost entirely locally produced.[2] As noted in Section 2, large scale electricity generation dates from 1928.[3] The Perak River Hydro Electric Power Company supplies under licence to the National Electricity Board most Perak mines, while the NEB (and before the war the Selangor Government) supplies most mines in Selangor and other states. There can be little doubt that the large scale generation of power in Malaysia is the result of tin mining. In 1936 and 1937 respectively, the earliest years for which such figures are available, mines (mainly tin) took 80.9% of the units generated by Perak River Company's and 83.8% of the Selangor Government's output.[4] In 1950 75% of the units generated by public utilities (including

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[1] This would be the sort of government policy advocated by G.M. Meier to strengthen linkages from the export to the domestic sector. See Subsection II - 3iii.

[2] In South Johore until the early 1960's electricity was 'imported' from Singapore, see United Nations, Electric Power in Asia and the Far East 1945-65, op.cit., p. 20.

[3] Earlier, generation of electricity on a small scale had occurred not only on mines but for public consumption. Thus the AR of the Resident General FMS for 1905 notes the construction of a small power station to supply light for Kuala Lumpur.

[4] See AR Perak 1936, and AR Electricity Department FMS, 1937. Of course since large power consumers are charged lower rates than domestic consumers, the percentages of revenue generated by mines would have been lower This applies also to the post war period.

companies operating under licence) was sold to mines.[1] By 1967 other large consumers were becoming important and mines consumed only 40%.[2] The 1965 input-output table[3] shows that value-added in 1965 was 66% of gross output, of which salaries and wages were 27 percentage points and entrepreneurial income 39. Mining purchases as given in the input-output table were 21% of the value of electricity output. These purchases ($41.1 million) correspond almost exactly to the mining purchases from the Census of Mining Industries in West Malaysia, ($41.3) given in Table 14.

Timber purchases by tin mining represent only a small part of the timber industry's output. In 1968 they were an amount equal to less than 5% of the total exports of timber from West Malaysia.[4]

The demand for iron castings is part of a more general demand by the industry for capital equipment and replacement items. Capital equipment is discussed in Section 5 and a case study of the local manufacture of machinery will be presented in Chapter VIII.

Coal was mined in Malaya from 1915 to 1960 by Malayan Collieries Limited, at Batu Arang in Selangor and briefly (1925-28) at Enggor in Perak. No figures for coal consumption by mines are available after

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[1] AR Central Electricity Board, 1950.

[2] Ibid., 1967.

[3] Electricity is grouped with water in the input-output table, but electricity predominates.

[4] ASET 1968.

the Second World War, but during the 1915-39 period mines consumed between a third and a half of the local output, the railways being the other main consumer. At its peak output in 1929 Malayan Collieries Limited, employed nearly 4,000 workers, this total not being reached again until 1936.[1] Again, one cannot be certain that coal mining owes its existence to tin; only that the existence of a large scale consumer would have been an important factor in the original investment decision.[2] No wage or value-added figures are available for coal. Output declined progressively after a post-war peak during the Korean boom. It suffered both from exhaustion of deposits and the competition of imported fuel oil.

The beginnings of railway development were connected with the tin industry,[3] but connection is not one of direct economic "linkage". In 1916, the earliest year for which such figures are available for the FMS, transport of tin ore accounted for only 2% (sic) of total railway revenue, and 5% of goods revenue.[4] This low percentage was not due to any predominance of receipts from rubber, which were themselves only 5% of total receipts and 10% of goods receipts. The transport of coal, coke, and firewood, much of which would have been for the tin industry,

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[1] See BSMI to 31 December 1955 for output figures for 1915 and employment figures from 1929 to 1955 and BSMI 1956-60 for figures to 1960.

[2] However they were owned and operated by the mining and engineering firm of Osborne and Chappell, which has close connections with tin mining. They were floated in 1913 with a capital of $2 million (See AR, Mines Department, FMS 1911 and 1913).

[3] See Section 1.

[4] AR Railway Department, FMS, 1916.

constitutes only another 4% of total receipts, Similarly, in the first year of operation of the Taiping - Port Weld line (a line built to connect the mining centre with a sea port) receipts from the transport of ore were only 7% of the total, firewood for mines was about 15%, passengers about 30% and the rest was from goods, parcels and sundries. Clearly the early railways derived their revenue from the general development resulting from tin mining (and later from rubber) rather than the transport of the ore (or rubber) itself.

Finance for railway construction in the FMS came mainly from current government revenue.[1] Much of this revenue in turn came from export duties. From 1884 to 1910 the peak period of railway construction, tin export duty contributed 36% of total FMS revenue. Railway receipts themselves (starting 1885) made up another 16%. By 1910 rubber export duty had not yet reached the $1million level while tin revenue was over $7 million.[2] A further source of revenue connected with tin was receipts from the renting of opium "farms", Chinese miners being the main smokers of opium. According to Lim Chong Yah's figures such revenue

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[1] Lim Chong Yah, Economic Development of Modern Malaya, op.cit, p. 275, calculates that from 1884 to 1937 (the period during which virtually all of the present system was built)over 75% of the total expenditure on railway building had come from current FMS revenues. The FMS government also undertook the construction of railways in the UMS, as well as being responsible for almost all railway building in the FMS itself.

[2] 1889-1910 figures calculated from AR Chief Secretary FMS, 1938. 1884-88 railway revenue and total revenue figures are from AR's of Perak, Selangor, Negri Sembilan/Sungei Ujong/Jelebu. 1884-88 export duty figures are from Wong Lin Ken, op.cit., p. 251. No export duty figure for Selangor is available for 1884, and no figures are available for Pahang to 1888.

comprised approximately 13% of total revenue over the period 1898 to 1906,[1] and it was probably a higher proportion in earlier years.

Railway construction was not merely a passive response by the FMS government to the needs of export industries. The FMS government, or more particularly the Resident-General, Sir Frank Swettenham, saw railways as a method of developing the new country:

> "Seeing the value of railways as an investment in this country and recognising the enormous indirect benefits to be gained from them, I propose to join up the four isolated sections by the construction of about two hundred miles of line, that would probably at first reduce the percentage of earning, but would make the business of management easier and cheaper, would open up valuable mining and agricultural land, would substitute rapid and cheap means of intercommunication for the existing defective arrangements and would put all three Western States in direct Railway communication with Penang and ocean-going steamers."[2]

Roads, also constructed out of current revenue, were used as feeders to railways, although after motor transport was introduced in 1902 they became increasingly competitive with rail transport.[3]

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[1] Op.cit., p. 254. Lim gives aggregate figures of opium revenue and total revenue for Perak and Selangor 1898-1906 and Negri Sembilan 1901-06, based on the Opium Commission Report, SS and FMS, 1909.

[2] From Colonial Office, Eastern No. 70, SS Correspondence respecting Railways in the Native States of the Malay Peninsula, June 1900. Letter by Sir F.A. Swettenham to the Governor of the SS, 7 January, 1897, p. 11.

[3] See Lim Chong Yah, op.cit., pp. 276-282 for a discussion of road development in Malaya.

IV - 4ii Forward Linkages

The development of the tin smelting industry in Malaysia was described briefly in Section 2. No official information is available on the industry except in the Interindustry Accounts, where it is included only under the broad heading of Basic Metal Industries. It is not included in the Censuses - and Surveys of Manufacturing because the secrecy injunction under the Statistics Ordinance does not allow publication of data for any grouping containing less than three firms. Thus the discussion here is based entirely on interviews with the two smelters in November 1970, and on their published accounts.[1]

Each smelter has an annual throughput of about one million pikuls of ore,[2] for which a charge of approximately $5 per pikul is levied. Thus the output of each smelter is approximately $5 million. Each smelter employs some 600 workers, so that output per head is under $8,000 per year. It is impossible from the available data to calculate non-wage value-added per head, which is used in this study as a measure of capital intensity. If an annual wage of $2,000 is assumed,

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[1] Accounts from Stock Exchange of Malaysia and Singapore Committee 1969-70, Company Reports, Volume IV(1969) (Singapore, 1970).

[2] This is equivalent to 88,095 tons of metal, compared to a Malaysian output in 1968 of 75,068 tons (see Appendix IV - 1). The difference arises from the importation of ores from Indonesia for smelting. Before 1965 large quantities of ore were also imported from Thailand.

non-wage value-added might approach a maximum of $5-6,000 per year, which is below the average for Pioneer manufacturing industries ($9,493) and compares to $5,024 for all manufacturing industry covered by the Census of Manufacturing.[1] The size of the two smelters is also indicated by the current value of their issued capital (as of December 1969), which was $180 million in the case of the Straits Trading Company and $66 million for the Eastern Smelting Company.[2] Both companies have very high profits in relation to value of output, probably indicating substantial income from other investment holdings.[3]

In addition, the smelting industry is served by a network of ore-buying agencies of the main smelting companies together with a number of licenced ore-dealers in the mining districts, although most dredges sell direct to the smelter.[4]

The only other industry in Malaysia using tin as an input is the manufacture of pewterware, carried on by the Selangor Pewter Company in Kuala Lumpur. Pewter is over 95% pure tin. Pewter manufacturing is grouped in the Censuses and Surveys of Manufacturing under the Industry Code 4563, "Brass, Copper, Pewter, and Aluminium Products". This grouped data are sufficient to show that the industry is insignificant in comparison to the tin mining industry itself. Purchases of tin by the

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1 CManI., 1968.

2 These can be compared to a value of nearly $110 million for the largest dredging company, Berjuntai (see Appendix IV - 7).

3 The Straits Trading Company profits for 1968 were $9.2 million after tax (tax payment not available), and $4.4 million for Eastern Smelting after tax (tax paid: $3.6 million). (See Company Reports, op.cit.)

4 See Yip Yat Hoong "The Marketing of Tin Ore in Kampar", Malayan Economic Review, 4, 1959. This is a case study of ore-marketing in a major mining district of Perak.

industry in 1968 amounted to $394,000 which is a mere 0.06% of the 1968 value of tin output.

Tin cans are made in Malaysia, but the tin sheet is imported. Tin metal is a small proportion of the value of tin plate output, and its production is subject to economies of scale sufficiently large to ensure its location near the main consuming countries. It is not produced in Malaysia.

Section IV - 5 Tin Mining Capital Payments

This section sets out tin mining capital requirements for the dredging and gravel pump sectors. As in Section 3, the aim is to split inputs into those of foreign and of local origin. The effects of the local payments on the domestic economy are examined separately in Chapter VIII, which is a case study of the Malaysian engineering industry. Chapter VIII contains a description of the engineering aspects of dredge construction, which can be read usefully alongside the present section.

IV - 5i Tin Dredging

Information was gathered through personal interviews with dredge construction contractors and mining companies in Malaysia in 1970 on the capital cost structure of four dredges built during the last ten years. Like most dredges now built in Malaysia, they are of roughly a half million cubic yards monthly capacity, or more. For reasons of confidentiality neither the names, dates of construction, nor exact capacities are given. These dredges represent about half of the new dredge building in Malaysia during the postwar period.

Table 35 gives a detailed breakdown of capital costs for Dredge A.[1] Of the estimated 27% points of local expenditure, nearly 16 are

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[1] On this and all other dredges quoted, prior development of the site and construction of staff and worker housing may cost up to $2 million, entirely a local expenditure. (Interview with dredging company in Malaysia, October 1970).

TABLE IV - 35

LOCAL COMPONENTS OF CAPITAL EXPENDITURE: DREDGE A

LOCALLY MADE ITEMS	($000)	% OF TOTAL DREDGE COST
1. Pontoon-fabrication	140.0	1.55
2. Superstructure-fabrication	199.6	2.22
Fabrication of Secondary Steelwork		
3. Drop chute and Slid Scuttle	64.5	0.72
4. Saveall	21.5	0.24
5. Screencase and Distribution System	43.0	0.48
6. Jigs	206.4	2.30
7. Jig Discharge Chute	21.5	0.24
8. Secondary Jig Discharge Chute	8.6	0.10
9. Concentrates Sumps and Chute	8.6	0.10
10. Store Chutes	21.5	0.24
11. Overburden Chute	38.7	0.43
12. Concentrates Piping and Cyclones	4.3	0.05
13. Water Service	60.2	0.67
14. Jig Water Tanks	6.5	0.07
15. Pontoon Bilge Service	10.8	0.12
16. Fairleads	36.6	0.41
Total Secondary Steelwork Fabrication	552.7	6.15
Electrical Equipment		
17. Main H.T. Cubicle	23.2	0.26
18. Power Cables	51.6	0.57
19. Lighting Cables	2.6	0.03
20. Electrical Incidentals	6.5	0.07
21. Erection and Painting	516.0	5.74
22. Other Local Costs	731.0	8.13
23. Local Site Costs	241.7	2.69
Total Local Expenditure	2464.9	27.43
Total Costs	8987.0	100.00

Sources and Notes: 1) Items 1 and 2 calculated by subtracting cost of imported steel at $360 a ton from total cost of pontoon and superstructure. The result obtained is consistent with fabrication at $120 a ton. Tonnages obtained from dredge contractor. Fabrication is 25% of total cost of pontoon and superstructure.

2) For secondary steelwork, fabrication is assumed to be 50% of total cost. This is an approximation to the 1966 figures, the earliest available, for Industry 4510, Fabricated Structural Shapes, (Survey of Manufacturing Industries in West Malaysia 1967) where steel purchases are 46% of the value of gross output. Secondary steelwork is more complex than the pontoon or superstructure.

3) Item 22 includes supervision, insurance, supply and fitting of rubber linings, electrical installation, and port and local freight.

4) Item 23 excludes imported items included in site costs.

5) Figures obtained from interview in Malaysia, October 1970.

for fabrication and erection. This figure, which in absolute terms is ＄1.47 million, is rather high. The usual payment to the labour contractor is ＄1 million to ＄1.25 million, but it is possible that a higher proportion of secondary steelwork than usual was bought locally or that the method used in Table 35 slightly overestimates fabrication costs for secondary steel. If fabrication and erection are reduced to ＄1.25 million, the total local content falls to 25%.

Summary figures for Dredges B and C are shown in Table 36. Some further details, not shown, were provided for B, which helped interpretation of the figures. For C no supplementary information was given and the exact basis for certain estimates is not known. It is likely that some items included under fabrication for A would be included under Materials for B and C. For Dredge D data was not directly comparable with that of Tables 35 and 36. The total cost of ＄10.6 million was split as follows:-

Contract labour	＄1.0 million (9.4%)
Other labour	＄0.2 million (1.9%)
Materials	＄7.5 million (70.7%)
Other costs	＄1.9 million (19.0%)

It was estimated by the company that 85% of materials were imported, including ＄0.75 million for heavy castings, and ＄1 million for the main drive unit and electrical equipment. Other costs would include freight from overseas, local site costs and probably site development such as housing, which is not given for dredges A, B and C. If 15% of materials is assumed to be local, and at least 50% of other costs, total local content is 27%.

It is impossible to discuss for each individual dredge exactly which items were locally purchased. However, none purchased everything which was available from Malaysian manufacturers. It is probable that with local electrical equipment and steel castings the local content could be raised to 35%. Problems of raising this proportion further are discussed in Chapter VIII.

Total investment demand from dredging consists of new dredge construction and the rebuilding of old dredges. Table 37 shows dredge construction and reconstruction for the postwar period.[1] However since the data collected refer mainly to the last ten years, investment expenditure is calculated from 1961 only, and the 1946-61 construction figures are given for comparison only.

TABLE IV - 36 SUMMARY OF LOCAL COMPONENTS OF CAPITAL EXPENDITURE: DREDGES B AND C

($000)	DREDGE B	DREDGE C
Fabrication	750	(1,066
Erection	500	(
Local Materials Purchases	188	341
Local Freight and Port Charges	130	256
Local Site Costs	400	639
Taxes and Import Duties	...	256
Total Local Expenditure	1,968	2,558
Total Dredge Cost	8,979	12,400
Local Expenditure as % of Total Dredge Cost	21.92	20.63

Sources and Notes: 1)For Dredge B, Fabrication was included in Local Materials in the original data. Contract labour was $1.25 and fabrication and Local Materials were calculated as residuals. At least half of Local Materials were steel castings. Site costs exclude estimated imported items.
2) For Dredge C, Local site costs *may* include imported items.
3) Figures obtained from the mining companies concerned.

[1] No data on local content are available for the period before 1939 so there is little value in calculating investment expenditure.

TABLE IV - 37 DREDGE CONSTRUCTION IN WEST MALAYSIA, 1946-70

	NEW DREDGES (NAMES AND MONTHLY CAPACITY IN CUBIC YARDS)	DREDGE CONVERSIONS AND RECONSTRUCTIONS (NUMBERS)
1946	-	1
47	-	-
48	-	-
49	Petaling No. 6 (440,000)	4
1950	-	6
51	Malayan Tin No. 7 (396,000)	1
52	-	1
53	-	5
54	-	7
55	-	3
56	-	2
57	-	3
58	-	3
59	Malayan Tin No. 4 (432,000)	-
1960	-	2
61	-	3
62	-	2
63	-	5
64	Berjuntai No. 6 (500,000)	2
65	Malayan Tin No. 7 (600,000)	-
66	Selangor Dredging (450,000)	1
67	-	...
68	/Aokam No. 3 (390,000)/	...
69	-	...
1970	Berjuntai No. 7 (750,000); Petaling No.7 (480,000) Conzinc Rio Tinto (815,000)	...

Sources and Notes: 1) 1946-66 figures from Dredge Data Chart 1965, WM Department of Mines.
2) 1966 figures from Dredge Data Chart may not include work started after 1965.
3) 1966-70 figures from interviews.
4) Berjuntai No. 7 and Conzinc Rio Tinto not yet completed at end of 1970.
5) Aokam No. 3 was exported to Thailand.

The total value of new construction is relatively easy to calculate. A dredge of the 500,000-800,000 capacity costs $8 million-$12 million, say $9 million average, spread over two years. The cost of dredge conversion is much more variable. To dismantle and reconstruct on a new site may cost $5 million or more. Conversions such as lengthening the bucket ladder, converting from steam to electricity or from palongs to jigs, cost less. One recent conversion cost $2 million, of which $500,000 was for imported steel. Table 38 estimates investment expenditure on the (heroic) assumption that the average cost of a reconstruction is $2 million.

TABLE IV - 38 DREDGING INVESTMENT IN WEST MALAYSIA, 1961-70

($M.)	NEW CONSTRUCTION	RECONSTRUCTION AND CONVERSION	TOTAL	ESTIMATED LOCAL PAYMENTS
1961	-	6	6	3.6
62	-	4	4	2.4
63	4.5	10	14.5	7.1
64	9.0	4	13.0	4.6
65	9.0	-	9.0	2.2
66	4.5	2	6.5	2.3
67	(4.5)	...	...	...
68	(4.5)	...	...	...
69	9	...	...	...
1970	14	5 minimum	19	6.5

Sources and Notes: 1) Table 37 figures (for numbers of constructions) are prorated with assumed costs of new constructions ($9m. per dredge) and reconstruction ($2m. per dredge).
2) 1967-68 new construction figures are for Aokam dredge exported to Thailand.
3) Local content taken as 25% for new construction, and 60% for conversions.

Official figures are available for dredging investment from 1968, in the Census of Mining Industries in West Malaysia 1968, published 1970. These are set out in Table 39, together with maintenance statistics. These estimate machinery purchases at approximately $20 million. This seems a rather high figure, matched only in 1970 by the Table 38 estimates. Moreover, the 1970 estimate in Table 38 includes the Conzinc Rio Tinto dredge construction which started only towards the end of 1970. The official figure seems especially high since no new dredge construction occurred in 1968, except for export to Thailand, which should not be included in the official figures. $20 million of dredge conversion work would mean local purchases of up to $15 million, which is high in relation to the capacity of the dredging sector of the Malaysian engineering industry.[1] It is probable that the 1968 figure includes planned expenditure in part or in total for either Petaling 7 or Berjuntai 7, or both. If this is the case, the local payments proportion would fall.

The local payments will vary according to the proportion of new dredge construction. As shown above, new dredge construction typically embodies 25% local content, while conversions may be up to 75% local. Table 38 shows that total local purchases may rise to a maximum of some $7 million. Thus sum is equivalent to 3% of the gross value of 1968 dredging exports.[2] Thus in aggregate terms dredging investment purchases are small, although all concentrated on the engineering industry. Also concentrated on engineering are maintenance purchases amounting to

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[1] See Chapter VIII.

[2] 1968 export value from Table 11.

TABLE IV - 39

PURCHASES OF FIXED ASSETS, AND MAINTENANCE EXPENDITURE, TIN DREDGING, 1968

($000)	MACHINERY AND EQUIPMENT (EXCLUDING TRANSPORT BUT INCLUDING FURNITURE)	INTERNAL TRANSPORT EQUIPMENT	RESIDENTIAL BUILDINGS	NON-RESIDENTIAL BUILDINGS	OTHER CONSTRUCTION WORK	LAND	EXISTING BUILDINGS	TOTAL
New Fixed Assets	20,463	93	1310	160	3615	2854	97	28,592
Used Fixed Assets	2,329	4	-	-	-	-	-	2,329
Total Fixed Assets	22,792	97	1310	160	3615	2854	97	30,921
Maintenance Expenditure	16,714	368	2052	189	................1142................			20,465

Sources and Notes: 1) From CMinI, 1968.
2) 1968 is first year for which these data are published.

9.3% of 1968 export earnings, although the import content of dredge maintenance is much higher than for gravel pump tin mining. Dredge replacement items include buckets and other imported items.

IV - 5ii Gravel Pump Tin Mining

Capital cost data on gravel pump mines are given in a study carried out at the University of Malaya by Tan Theong Hean.[1] Tan's figures are for a 'typical' gravel pump mine of 20,000 cubic yards monthly capacity. These figures are given in Table 40 and compared to figures collected by interview for a mine in the Kinta district of Perak also of 20,000 cubic yards capacity.

It is clear from the figures that the only significant non-local expenditure is for the engines and pump items. In fact the pumps are made locally and the engines imported. The kongsi house, palong and engine sheds are local construction items, normally built of wood. Bunds, drainage, and roads are civil items, which are carried out by local contractors. Both sets of estimates indicate that about 40% of capital expenditure is local. Total capital and Maintenance Expenditure for 1968 is shown in Table 41. The figures of Table 40 indicate that about 10% of machinery and equipment is local. Thus the total demand for local new machinery in 1968 was approximately $1.8 million. Total

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[1] "A Study of the Sources and Nature of Credit in Chinese Tin Mining in Malaya", (University of Malaya BA Graduation Exercise, Kuala Lumpur, 1965-66). This is an unusually authoritative work for an undergraduate. Its author is in fact a member of a prominent Chinese mining family.

TABLE IV - 40 GRAVEL PUMP MINE CAPITAL COSTS

TAN FIGURES	($000)	% LOCAL CONTENT	MINE IN KINTA, PERAK	($000)	% LOCAL CONTENT
Piping	8	50	Water Piping	4	100
Kongsi House	12	100	Steel Piping	4	-
Palong	18	100	Electric Wiring	10	...
Development of Communications	5	100	Kongsi House	15	100
			Palong-materials	17	100
8" Gravel Pump plants (with prime movers)	25	4	-labour	3	100
			Engine Sheds (3)	6	100
Water pump (with prime mover)	24	4	Roads	3	100
			Drainage	3	100
Power Generator (diesel)	3	-	Bunds	4	100
Miscellaneous e.g. ore dressing shed	6	...	Engines and Pumps (3)	80	4
Total Cost	101		Total Cost	149	
% Local Content		41% (Min.)	% Local Content		39% (Min.)

Sources and Notes: 1) Tan figures from Tan Theong Hean, op.cit., p. 25.
2) Kinta mine figures from interview in Malaysia, December 1969.
3) Items whose local content is not known are treated as non-local for purposes of calculating minimum local content.

local capital expenditure, say 40% of new fixed asset purchases would be about $17 million, equal to 3.6% of 'Other Tin Mining' 1968 output.[1] Maintenance expenditure, equivalent to 7.6% of output is predominantly local and is larger than local investment purchases. Comparison with Section 3 of this chapter, especially Table 14 shows this maintenance expenditure is comparable in size with even the largest materials input, electricity. Local production to meet these demands is discussed in Chapter VIII, especially Subsection VIII - 2ii.

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[1] Output figure from Table 11.

TABLE IV - 41

PURCHASES OF FIXED ASSETS AND MAINTENANCE EXPENDITURE, 'OTHER TIN MINING', 1968

($000)	MACHINERY AND EQUIPMENT EXCLUDING TRANSPORT, INCLUDING FURNITURE)	INTERNAL TRANSPORT EQUIPMENT	RESIDENTIAL BUILDINGS	NON-RESIDENTIAL BUILDINGS	OTHER CONSTRUCTION WORK	LAND	EXISTING BUILDINGS	TOTAL NEW FIXED ASSETS
New Fixed Assets	17,991	2,398	1,158	863	7,764	12,798	95	32,067
Used Fixed Assets	4,388	570	-	-	-	-	75	5,033
Total Fixed Assets	22,379	2,968	1,158	863	7,764	12,798	170	48,100
Maintenance Expenditure	22,969	3,136	1,213	904		7,550		35,772

Sources and Notes: 1) From CMinI 1968.
2) 'Other Tin Mining' is predominantly gravel pump tin mining.

CHAPTER V

RUBBER

In contrast to tin, a large body of economic research has been built up on the rubber industry.[1] Studies have been made of agricultural developments before and during the early years of rubber,[2] of the early growth of the estate sector,[3] and of the industry between the two world wars.[4] There is a major study of the Federal Land Development Authority,[5] and there are investment appraisals of rubber planting both from a private and social viewpoint.[6]

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[1] Not all of this work is by economists. Geographers, historians, sociologists and anthropologists have produced much material of economic interest.

[2] J.C. Jackson, Planters and Speculators. Chinese and European Agricultural Enterprise in Malaya 1786-1921 (Kuala Lumpur, 1968).

[3] By Dr. J.H. Drabble of the University of Malaya, to be published in 1971 or 1972. A preliminary account is his "The Plantation Rubber Industry in Malaya up to 1922", Journal of the Malaysian Branch Royal Asiatic Society, Part 1, 1967.

[4] This is P.T. Bauer's classic work, The Rubber Industry. A Study in Competition and Monopoly, (London 1948). See also J.N. Parmer, Colonial Labor Policy and Administration, A History of Labor in the Rubber Plantation Industry in Malaya 1910-41 (New York 1960).

[5] G.D. Ness, Bureaucracy and Rural Development in Malaysia. A Study of Complex Organisation in Stimulating Economic Development in New States (Berkeley, 1967).

[6] A private investment calculation, given as a comparison to oil palm, is in J.W.L. Bevan and T.J. Goering "The Oil Palm in Malaysia. An Estimate of Product Prices and Returns to Investment," in Oil Palm Developments in Malaysia. Proceedings of the First Malaysian Oil Palm Conference, held by the Incorporated Society of Planters, Kuala Lumpur, 1967. Calculations of the social rate of return are given in A.R. Helm "Some Aspects of Post-War Agricultural Policy in West Malaysia", (University of Hull M.Sc (Econ) thesis, 1969), chapter 6; in FLDA, the Jengka Triangle Report, Appendix 11-2; and in I.M.D. Little and D.G. Tipping "A Social Cost Benefit Analysis of the Kulai Oil Palm Estate, West Malaysia" (mimeographed paper Nuffield College, Oxford, July 1970). Like Bevan and Goering, Little and Tipping calculate rubber rates of return for purposes of comparison with oil palm.

Since 1964 the Rubber Research Institute of Malaya has produced many useful studies of the economics of estate and smallholder rubber production.[1]

In view of the existing literature, this chapter is more selective in coverage than was the tin chapter and concentrates on a quantification of the economic effects of the estate sector.[2] This work is presented in Section 2, and follows the methods set out in Chapter III. Section 3 discusses the linkage effects of rubber and Section 4 sets out rubber capital expenditures, also following Chapter III's methodology. Section 1 is an extended introduction intended to place Section 2 into context, in view of the latter's selective nature. It is also hoped that it will make the chapter self-contained for a reader unfamiliar with the industry. Section 1 is not intended simply as a review of the literature on rubber. It draws on fieldwork and primary source material as well as secondary sources.

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[1] One worth particular attention is C. Barlow and Chan Chee Kheong's excellent paper on the organization of the industry, "Towards an Optimum Size of Rubber Holding", Natural Rubber Conference Kuala Lumpur, 1968.

[2] The other major gap in research which qualifies for study is the early development of smallholdings. This would be a difficult study - a thesis in itself - involving fieldwork with Land Office records in Malaysia and extensive interviewing of existing smallholders. See, however, P.T. Bauer, <u>Report on a Visit to the Rubber Growing Smallholdings of Malaya, July - September 1946</u> (London, 1948).

Section V - 1 The Structure and Development of the Industry

V - 1i The Present Structure of the Industry and its Development from the Second World War[1]

Natural rubber in Malaysia is obtained from the Para[2] rubber tree, *Hevea brasiliensis*. Rubber in liquid form, *latex*, is found in the bark of the tree.[3] Latex is obtained by tapping, the making of an incision in the bark with a knife. The latex is collected in cups of earthenware or glass suspended on the tree below the tapping cut. Also, about 15% of the crop is collected as scrap rubber.[4] The tree has an economic life of about thirty years.

The raw material collected from the field can be processed into several forms, the relative importance of which are shown in Table 1. Sheet and concentrate are made only from latex. Crepe, heveacrumb and comminuted rubber can be made from latex or scrap.

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[1] My understanding of the rubber industry has been greatly helped by two field trips in Malaysia in November and December 1969, and several other day visits, arranged by the Rubber Research Institute of Malaya. During these trips over twenty five estates and off-estate processing institutions were visited, together with smallholdings and some manufacturers of rubber estate equipment. I am most grateful to the RRIM and to the officers of the estates advisory service (Mr. Cho Shue Nam and Mr. P.S. Rama Rao) who accompanied me.

[2] So-called after the port of Para in Brazil from which the original rubber seeds from the Amazon were shipped.

[3] Latex contains about 70% water and 30% rubber. The dry rubber content (DRC) of one gallon of latex is about three pounds of rubber.

[4] This is mainly in the form of coagulated rubber collected on the previous day's cut or in the cups - tree lace and cup lump respectively.

TABLE V - 1 RUBBER EXPORTS FROM WEST MALAYSIA 1968, BY TYPE OF RUBBER

		PERCENTAGE OF TOTAL TONNAGE OF GROSS EXPORTS
1.	Ribbed Smoked Sheet	60.5
2.	Crepe	17.1
3.	Latex Concentrate	14.3
4.	Heveacrumb and Comminuted Exported under Standard Malaysian Rubber Scheme	6.9
5.	Other Forms	1.2

Sources and Notes: 1) From RSH 1968.
2) Unit values will differ slightly and understate the relative importance of items 3 and 4 in total export value.

Crepe was the form into which most latex was processed in the early days of the industry before 1930. Today crepe is mostly made from scrap.[1] The raw material is fed through creping rollers (heavier machines than sheeting batteries) and air dried. In the manufacture of latex concentrate, latex is concentrated usually in centrifuges to about 60% DRC, and mixed with ammonia to prevent coagulation during shipment to the final consumer.[2]

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[1] An exception to this is sole crepe made from latex into a form ready for attachment in the consumer's factory to shoe uppers. See J.E. Morris "Sole Crepe", Planters' Bulletin, September 1964.

[2] Concentrated latex is used for making products such as foam rubber which requires the raw materials in liquid form.

New-process rubbers (Heveacrumb and Comminuted) are described further in Subsection 1v on technology. They can be produced in conventional sheeting factories by replacing the existing coagulum size reduction machinery (i.e. the sheeting battery) and the drying facilities.

The rubber industry traditionally is divided into two sectors, estates and smallholdings. A rubber estate is defined as "lands, contiguous or non-contiguous aggregating not less than 100 acres in area planted with rubber or on which the planting of rubber is permitted, and under a single legal ownership".[1] The definition of a rubber smallholding is the same, but refers to an area of under 100 acres. The relative importance of these two sectors is shown in Table 2. The main economic distinction between them lies in their degree of use of wage labour.[2] A smallholding would be characterised by its use of family labour. Table 3 shows the use of different types of labour by smallholdings. It should be studied in conjunction with Table 4 which shows the relative importance of the various size groups within the smallholding sector. The predominance of family labour on holdings below ten acres is clear. Family labour merges into sharecropping.[3]

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[1] Definition from RSH 1968.

[2] Of course there are many other distinguishing features which are discussed below.

[3] Sharecropping, known as the bagi dua system in Malaysia (bagi dua is a Malay expression meaning splitting into two parts), usually involves the share tapper receiving between 40% and 60% of the value of the crop for his labour.

TABLE V - 2 ACREAGES, PRODUCTION AND WORKING POPULATION OF ESTATES AND SMALLHOLDINGS IN WEST MALAYSIA, 1968

	'000 ACRES	PRODUCTION (TONS)	WORKING POPULATION('000)
Estates	1676	563,041	207
Smallholdings	2582	471,666	446 (1966 figure)

Sources and Notes: 1) Acreages and smallholder production from RSH 1968. Estate production and workforce from Appendices V - 1 and 2.
2) Smallholding working population figures from Barlow and Chan, op.cit., p. 6.

TABLE V - 3 TYPES OF LABOUR USED ON RUBBER SMALLHOLDINGS MALAYA 1960
(% of total workforce of each size group)

SIZE GROUP (ACRES)	FAMILY LABOUR ONLY	FAMILY LABOUR & SHARE CROPPING	SHARE CROPPING ONLY	CONTRACT LABOUR ONLY	WAGE LABOUR ONLY
0 - 10	70	4	25	-	1
10 - 15	46	11	37	1	4
15 - 25	29	17	42	1	9
25 - 50	17	19	47	1	12
50 - 100	5	15	47	1	24
Over 100	2	6	24	2	62
All	65	6	27	-	2

Sources and Notes: 1) From FM, Census of Agriculture 1960, Volume 6, Farms Reporting Rubberland.
2) The 'over 100 acre' group comprises only 0.1% of the farms covered. It presumably includes those holdings over 100 acres which have not been listed under the estate category. It provides a comparison with what is in effect the smallest type of estate.

TABLE V - 4 SIZE DISTRIBUTION OF RUBBER SMALLHOLDINGS IN MALAYA, 1960

SIZE GROUP (ACRES)	% OF NUMBER OF HOLDINGS IN CENSUS	% OF CENSUS SMALLHOLDING ACREAGE
0 - 3	41	12
0 - 5	64	28
0 - 10	87	57
10 - 25	11	28
25 - 50	2	9
50 - 100	-	4
Over 100	-	2

Sources and Notes: 1) From FM, Census of Agriculture 1960, Volume 6, Farms Reporting Rubberland, and Volume 6A Rubberland: Acre and Production.

In none of the size groups shown below a hundred acres, is wage or contract labour predominant. Since the larger proportion of West Malaysian smallholder acreage is in farms of under ten acres, the dependence of the sector on family labour is clear.[1] In contrast, virtually all estate labour receives money wages, over 80% are directly employed, and the rest are on contract.[2]

The estate sector has 75% of its acreage in estates of over a thousand acreas (see Table 5). European ownership predominates in the larger size groups.[3] Nearly 85% of the European estate acreage is controlled by fourteen leading agency houses, of whom Guthries and Harrison and Crosfields are the largest.[4] Tyre manufacturing companies also own substantial rubber interests.[5]

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[1] An important qualification must be made here. The 1960 Census of Agriculture covered only about 0.9 million acres of a total smallholder acreage of 1.8 million. This was due mainly to the exclusion of holdings owned by certain city dwellers. It is likely that these were in the larger size groups, since the average holding of the city dwellers who were included was larger than the rural holdings. See J.M.F. Greenwood, "Rubber Smallholdings in the Federation of Malaya", Journal of Tropical Geography, August 1964 pp. 81-86. Nevertheless it should not be assumed that most city-held smallholdings are in the larger (say twenty-five acre +) size group. In a case study of mainly urban held Chinese smallholdings in the Rasa mukim of Ulu Selangor, D.W. Fryer and J.C. Jackson found that 95% of Chinese smallholdings were below 25 acres, with average size 5¼ acres. See their article "Peasant Producers or Urban Planters ? The Chinese Rubber Smallholders of Ulu Selangor" Pacific Viewpoint, September 1966.

[2] See HLS, 1968.

[3] For a description of the organization of a European estate see E.E. & S.R. Shepherd Bukit Sembawang. A Rubber Estate (Melbourne, 1968). This account is intended for senior schoolchildren but it is a most useful introduction for anyone unfamiliar with the industry.

[4] The control is exercised through a complex of holding companies, cross-company investments and interlocking directorships. See D.W. Fryer, "The Plantation Industries - The Estates" in Wang Gungwu (editor), Malaysia, A Survey (London 1964). Agency houses are discussed at length in Chapter II of J.J. Putchucheary, Ownership and Control in the Malayan Economy (Singapore, 1960). The origins and organization of agency houses are described in Chapter 4 of K.M. Stahl, The Metropolitan Organization of British Colonial Trade. Four Regional Studies (London, 1951).

[5] Fryer, op.cit., p. 239.

TABLE V - 5 SIZE AND RACIAL DISTRIBUTION OF RUBBER ESTATE ACREAGE IN WEST MALAYSIA, 1966

SIZE GROUP (ACRES)	% OF ESTATE ACREAGE	% EUROPEAN	% ASIAN
100 - 500	16	3	97
500 - 1000	10	22	78
1000 - 2000	20	50	50
2000 - 3000	15	72	28
3000 - 5000	19	81	19
Over 5000	21	78	22
All	100	56	44

Sources and Notes: 1) From RSH 1966.
2) 1966 is the last year for which statistics are broken down by race. Thereafter the breakdown is one of citizenship. This is not the same as the racial breakdown since resident Europeans may hold Malaysia citizenship and more important, resident Asians may not always be citizens. Use of citizenship would overstate the size of the foreign sector.
3) An estate is classified as European (or Asian) if 50% or more of its shares are owned by Europeans (or Asians). This may be misleading if there are substantial minority share holdings, e.g. by Asians in European estates.

TABLE V - 6 RUBBER ESTATE LABOUR FORCE, IN WEST MALAYSIA, BY RACE 1938-68 SELECTED YEARS

(Percentages of Total Labour Force)

	1938	1947	1957	1968
Malays	2	20	19	23
Indians	80	52	51	46
Chinese	17	27	29	31

Sources and Notes: 1) 1938 figure from RSH 1938. 1947 and 1957 from Lim Chong Yah, Economic Development of Modern Malaya, op.cit., p. 334. 1968 from HLS 1968.
2) Pre-war 'Malays' include Japanese.

TABLE V - 7 RUBBER ACREAGE IN WEST MALAYSIA, 1929-68, SELECTED YEARS

(000 ACRES)	ESTATES	SMALLHOLDINGS
1929	1827	1144
1939	2068	1305
1947	1934	1580
1953	2030	1606
1968	1676	2582

Sources and Notes: 1) 1968 from RSH 1968. 1929-66 from P.O. Thomas and A. Fong Chu Chai, Rubber Industry Statistics (Kuala Lumpur, 1968).

Of the Asian estates in 1952 61% were owned by Chinese, 15% by Indians and the remainder by Others (including Malays).[1]

Table 6 shows how Malay (and Chinese) participation in the rubber estate labour force has been increasing, a change largely occurring during the war. M.G. Swift puts forward the idea that Malay participation also increased during the Emergency when Chinese were removed to New Villages.[2]

Estate acreage has declined after reaching a peak in 1953 after the Korean boom. The 1968 acreage is substantially less than that of 1929, as shown in Table 7. Reasons for the decline include a partial flight of capital from Malaysia as a result of the communist Emergency (1948-60) and of Independence (1957), switches in estate cultivation from rubber to oil palm, and the fact that little new land has been alienated to estates since the war (or indeed since 1922). It was estimated that from 1951 to 1960 over 200,000 acres were sold by estates and subdivided into smallholdings.[3] Between 1947 and 1968 palm oil estate acreage rose by over 300,000 acres.[4] Recently the government declared its hope of involving the private sector in large scale land development, but little appears to have come of this so far.[5] In

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[1] From Lim Chong Yah, op.cit., p. 331. Racial breakdown of the Asian ownership are available only for 1951-53.

[2] See Malay Peasant Society in Jelebu, (London 1965), p. 60.

[3] FM, Report of the Subdivision of Estates Committee, 1963, volume 1 p.3. This subdivision partly reflects a flight of capital. In other cases land was sold to finance replanting or estates were subdivided under the same ownership in order to qualify for the larger replanting grants given to smallholders. See pp. 123 - 136 of volume 1.

[4] 1947 figures from FM Malayan Agricultural Statistics, 1949, 1968 figures from OPCTS 1968.

[5] See Malaysia, Mid Term Review of Development under the First Malaysia Plan 1966-70 (1969), p. 56.

contrast to the estate sector, smallholding acreage has increased substantially since the war, with a peak increase, as Table 8 shows, in the early 1960's.[1] Table 9 shows the forms in which new planting has occurred. It also shows the relative importance of smallholdings of various types. For purposes of description the smallholding sector can be divided into two:- unassisted smallholders and smallholders on schemes, especially those of the Federal Land Development Authority (FLDA).

TABLE V - 8 ANNUAL RATES OF NEW PLANTING OF RUBBER ON ESTATES AND SMALLHOLDINGS, WEST MALAYSIA, 1946-68

(000 ACRES)	ESTATES	SMALLHOLDINGS		ESTATES	SMALLHOLDINGS
1946	-	-	1957	16	11
47	1	-	58	14	11
48	7	2	59	14	21
49	7	2	1960	22	25
1950	6	3	61	18	67
51	15	5	62	10	82
52	7	7	63	9	100
53	5	6	64	6	57
54	7	3	65	5	40
55	10	8	66	3	27
56	15	13	67	2	22
			68	1	42

Sources and Notes: 1) 1946-66 from Thomas and Fong, op.cit. 1967-68 from RSH 1967-68.

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[1] The peak years of 1962-3 are comparable in magnitude with the peak years of the early growth of the smallholder sector 1910-19. See Table 16 below.

TABLE V - 9

NEW PLANTINGS OF RUBBER ON SMALLHOLDING IN WEST MALAYSIA, 1952-67, AND DISTRIBUTION OF 1968 SMALLHOLDING ACREAGE

(000 ACRES)	FLDA SCHEMES	STATE SCHEMES	FRINGE SCHEMES	OTHER SUBSIDISED SCHEMES	RI(R)B SCHEMES	UNSUBSIDISED INDIVIDUAL SCHEMES	UNSUBSIDISED BLOCK PLANTING	CONTROLLED ALIENATION				TOTAL
New Planting	126	38	130	12	72	67	134	26				605
									FROM ESTATE SUBDIVISION 1954-68	ACREAGE REPLANTED SINCE 1952	OLD RUBBER	
1968 Acreage	128			578					257	914	705	2582

Sources and Notes: 1) New planting adapted from Mohd. Noor bin Wahib and K.C. Arun "Smallholdings in West Malaysia", Natural Rubber Conference 1968, preprint, table 3 p. 4. 1968 from RSH 1968.

2) Although some new planting occurred there was virtually a ban on land alienation until the late 1950's. Over 90% of the plantings shown occurred after 1958.

3) Other post war new plantings are larger than those given in Mohd Noor and Arun, op.cit., even including the acreage (40,000) acres planted in 1968.

4) The dates from which figures for subdivision and replanting are given are those from which those items became important.

In the case of unassisted smallholders,[1] the predominantly small size and use of family labour has already been established (see Tables 3 and 4). A number of case studies have been made of smallholder areas, which are most useful supplements to the quantitative information available from the Census of Agriculture and elsewhere.[2]

Table 10 shows the ownership of smallholdings by race for 1952, one of the latest years for which such figures are available.[3]

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[1] Unassisted here refers to smallholders who are not on subsidised new planting schemes. The definition includes smallholders who may have received help under replanting schemes, which are discussed below.

[2] See in particular D.W. Fryer and J.C. Jackson, "Peasant Producers or Urban Planters", op.cit; E.K. Fisk "Productivity and Income from Rubber in an Established Malay Reservation", Malayan Economic Review, April 1961; Voon Phin Kheong, "Chinese Rubber Smallholding Industry in Selangor" (University of Malaya MA thesis, Kuala Lumpur, 1967); M.G. Swift, Malay Peasant Society in Jelebu, op.cit., and "Capital, Saving and Credit in a Malay Peasant Economy", in R. Firth and B.S. Yamey (editors). Capital, Savings and Credit in Peasant Societies. Studies from Asia, Oceania, the Caribbean and Middle America (London, 1964). There is also P.T. Bauer, Report on a Visit to the Rubber Growing Smallholdings of Malaya, 1945., op.cit; and T.R. McHale's survey "Rubber Smallholdings in Malaya. Their Changing Nature Role and Prospects", Malayan Economic Review, October, 1965.

[3] Since 1952, Chinese have acquired an increased acreage from the subdivision of estates. Over 75% of such acreage was bought by Chinese (see Report of Subdivision of Estates Committee, op.cit., Volume 1, p. 138), say 200,000 acres, which is about a third of the increase in planted area since the war. For the smallholder sector as a whole the increase in Chinese acreage may well have been outweighed by the predominance of Malays in official schemes (for acreages of which see Table 9).

TABLE V - 10 OWNERSHIP OF MALAYAN SMALLHOLDING ACREAGE, 1952, BY RACE

(Percentages)	HOLDINGS BELOW 25 ACRES	HOLDINGS 25-100 ACRES	ALL SMALLHOLDINGS
Malay	55	5	47
Chinese	36	66	41
Indian	6	15	8
Other	2	13	4

Sources and Notes: 1) From J.C. Jackson, "Smallholding Cultivation of Cash Crops", in Wang Gungwu, op.cit., p. 249. Figures are originally from RSH 1952.
2) Ownership of acreage by race is available only for 1951-53.

The split between Chinese and Malay ownership corresponds to differences in the economic organization of the Malay and Chinese holdings. Chinese own most of the larger holdings, which use share tappers and paid labour. Moreover even in the size group below 25 acres, there is what corresponds to an urban/rural split between the two races. Most Chinese smallholdings are near urban areas, where there has been a tradition of Chinese settlement. Tin mining areas are the prime example.[1] The urban nature of Chinese smallholding ownership was strengthened by the resettlement of Chinese into New Villages during the Emergency.[2] Most Malay holdings are in areas removed from urban

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[1] Fryer and Jackson, op.cit., p. 199.

[2] The grouping of rural Chinese into some 400 resettlement areas, or New Villages, was carried out to prevent communist insurgents (who were mostly Chinese) from obtaining food and supplies from Chinese squatters in rural areas. Although the Emergency was not formally ended until 1960, the worst was over by 1955. See A. Short, "Communism and the Emergency" in Wang Gungwu, op.cit.

centres.[1] This difference is of greatest importance in terms of the outside earnings of smallholders.

It was shown in Table 4 that most rubber smallholdings are less than five acres. A rubber tapper can work three to four acres a day.[2]

Assuming daily tapping, a typical holding of under five acres, offers full-time work for only one person.[3] Using data from the 1960 Census of Agriculture, Barlow and Chan[4] estimated that 21% of the family members on smallholdings covered by the Census, and half of the economically active members, worked at least part time outside the rubber holding. Fryer and Jackson in their study of the Rasa area of Ulu Selangor depicted Chinese smallholdings as providers of work often only for the females and children of urban families. Over two-thirds of the holdings with mature rubber in their survey had outside income. Typically older daughters and daughters-in-law might be occupied as paid tappers on nearby estates.[5] 20% of families in the Rasa survey had men

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[1] Fryer and Jackson, op.cit., p. 199.

[2] An average tapping "task" would be 600 trees, which is equivalent to 3.3 acres with a smallholding planting density of 180 trees per acre. Estates normally plant at a lower density, say 120 trees per acre. See C. Barlow and Lim Sow Ching, "Effect of Density of Planting on the Growth, Yield and Economic Exploitation of Hevea Brasiliensis, Part II, The Effect on Profit", Journal of the Rubber Research Institute of Malaya, Part I, 1967.

[3] Most smallholders tap daily and most estates alternate daily. See Ng Eng Kok, Ng Choong Sooi, and Lee Chee Kang, "Economic Analysis of Tapping Experiments", Natural Rubber Conference, Kuala Lumpur, 1968. Little maintenance work is done on many smallholdings and a tapper could process the latex he collected at the end of his morning's work.

[4] Op.cit., pp. 6-8.

[5] It is worth noting in this context that 47% of the West Malaysian rubber estates labour force consists of women. Another 3% are young persons. See HLS, 1968.

employed by tin mines, where average earnings are higher than on estates. Others had a variety of urban occupations. In the groups below five acres, 5 - 10 acres, and 10 - 25 acres, 69%, 62% and 48% of family income, respectively, came from outside earnings.[1] Similarly, Voon's study of Chinese smallholders in the Semenyih area of Ulu Langat (in Selangor) found that most had outside sources of income.[2]

Fryer and Jackson contend that Malay smallholding families do not have outside earnings from modern capitalistic activity.[3] Certainly there are areas of mixed Malay farming where the main alternative occupation is padi-growing. Swift describes such an economy where rubber provides a steady stream of income, rice provides food, and fruit sales provide seasonal income for lump sum expenditures.[4] The fact that a quarter of the estates labour force and a fifth of the mining labour force[5] is Malay does not suggest a complete isolation from capitalist activities.[6] Nevertheless, many Malay communities, at least in the west coast states, are isolated, in the sense that almost all

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[1] Fryer and Jackson, <u>op.cit.</u>, pp. 226-7.

[2] Voon Phin Kheong, <u>op.cit.</u>, p. 78.

[3] <u>Op.cit.</u>, p. 199.

[4] M.G. Swift, <u>Malay Peasant Society in Jelebu</u>, <u>op.cit.</u>, especially pp. 26-77.

[5] See Table 6 and Table IV - 8.

[6] Of course, these workers are not necessarily members of rubber smallholding families but it is at least intuitively plausible that many may be.

dealer activity is carried out by non-Malays.[1] Also, even in Malay Reservations, much of the income from rubber may accrue to non-Malays.[2]

Under Federal Land Development Authority schemes,[3] large blocks of land, usually about 4,500 acres, are cleared and planted in phases by contractors. Settlers[4] are moved in soon after, and after a period to accustom themselves to working on the scheme they are allocated land in plots of six-eight acres.[5] Settlers are provided with fertilizers and a subsistence allowance while their rubber is immature.[6] These, together with the establishment costs, are charged against the settler's loan amount to be repaid over a period of ten-fifteen years after the rubber becomes mature. The FLDA has been the spearhead of land develop-

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[1] See Swift, op.cit., p. 28.

[2] Fisk's study of a Malay Reservation, in an area of the (much researched) district of Ulu Selangor, showed that only 15% of potential income and less than a half of actual income from rubber accrued to Malays. Non-Malays owned 38% of the acreage, and over half of the Malay owned farms were rented out (by the relatively small number of Malay landlords) to Chinese. See op.cit., pp. 16-22.

[3] The classic study of the FLDA is G.D. Ness, Bureaucracy and Rural Development in Malaysia, op.cit. Two other very useful sources are FLDA, Land Settlement in Malaysia under the Federal Land Development Authority, (Kuala Lumpur, 1966) and FLDA, A Review of the Federal Land Development Authority - its Policies and Operations, (Kuala Lumpur, 1970). See also FLDA, The Role of Land Settlement in the Economic Development of West Malaysia (Kuala Lumpur, undated), and Tan Sri Taib bin Haji Andah (FLDA Chairman) The Application of Strategy to Tactics: FLDA - Case Study (Kuala Lumpur, 1968). I am grateful to the FLDA for allowing me to visit two of its rubber schemes - Bilut Valley in Pahang and Sungei Tiang in Kedah, in November 1970.

[4] Most settlers are rural Malays.

[5] This applies only to rubber schemes. Under oil palm schemes, settlers work blocks of about 200 acres, although receiving their share of profits on the basis of a hypothetical holding of 8-10 acres. Settlers on rubber schemes work on similar blocks before they are allocated individual plots (which are within the blocks in which they worked).

[6] The subsistence allowance is granted at a daily rate against work done on the settler's holding or on approved economic activities.

ment in Malaysia.[1 2] Other schemes are set out in Table 9. Fringe alienation schemes are administered by State governments, usually providing land in plots of 3 - 5 acres on land near existing settlements.[3] Such schemes are intended to supplement income from existing smallholdings, and are subsidised (on loan) to the extent of clearing, planting, and some fertilizers.[4] Unsubsidized block plantings are sometimes considered under the general heading of controlled alienation.[5] State schemes are similar in organization to FLDA schemes, and in most cases they have been taken over subsequently by the FLDA.[6]

FLDA schemes have tended to go more into completely under-developed areas than have other types. In future FLDA land developments are likely to be in large concentrated areas,[7] such as the Jengka Triangle project

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[1] See FM, Second Five Year Plan 1961-65, p. 30. Although FLDA was formed in 1956 the main expansion of its work dates from the start of the second plan period.

[2] Its overall importance in Malaysian land development is understated in Table 9 since by 1968 it had developed an acreage of oil palm equal to that of rubber, whereas most acreage under other schemes was planted with rubber.

[3] Ness, op.cit., p. 176.

[4] Mohd. Noor and Arun, op.cit., p.3.

[5] Then two categories are shown separately in Table 9 but are lumped together in Malaysia, Interim Review of Development in Malaya under the Second Five Year Plan (1963), pp. 6-8.

[6] The state of Kelantan is the exception to this statement. Kelantan has refused to hand over the administration of its schemes to FLDA.

[7] FLDA, Land Settlement in Malaysia, op.cit., p. 45.

already underway in Pahang and the Pahang Tenggara and South Johore projects for which master plans are currently (April 1971) being prepared. Such developments are hoped to achieve economies of scale both in planning execution and administration.[1]

As well as developing new land the government has had a major replanting programme underway since the early 1950's.[2] Replanting has been undertaken both to replace trees which were near the end of their economic life,[3] and to take advantage of new high yielding varieties. Replanting has been encouraged by government grants, financed by compulsory cesses on rubber exports.[4] Over the period 1953-68, 884,000 acres were replanted on estates and 889,000 on smallholdings, representing about half of the acreage (excluding new planted areas) of each sector, respectively.[5]

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[1] Ibid., p. 45.

[2] See FM, Report of The Mission of Enquiry into the Rubber Industry of Malaya (1954) (known as the Mudie report), and FM, Taxation and Replanting in the Rubber Industry (1955), which is the government statement of policy following the Mudie recommendations on replanting.

[3] Mudie, op.cit., p. 68, noted that half of the 1954 smallholding rubber acreage and a third of estate acreage had been planted more than 33 years previously.

[4] A convenient description of the replanting cesses can be found in Lim Chong Yah, Economic Development of Modern Malaya, op.cit., pp. 122-127.

[5] Figures calculated from Thomas and Fong, op.cit., p. 20 and RSH 1968.

In addition to the estate and smallholding sectors of the rubber industry there is a substantial marketing network of dealers and exporters and an off-estate processing sector. In West Malaysia there are over 2,500 licenced dealers,[1] together with an unknown number of unlicenced (illegal) ones. In the case of the smallholder rubber, marketing and processing are closely linked. About 75% of smallholder latex is sold as unsmoked sheet, to so-called first level buyers who smoke it before passing it on to middle dealers or exporters.[2] [3] Scrap is sold by first and middle dealers to remillers who manufacture it into crepe. A minority of smallholders, particularly in Selangor, use commercial group processing centres, where, for a fee, their rubber is smoked prior to sale to the dealer.[4] There are also Malay Group Processing centres whose construction has been financed mainly by MARA,[5] and whose operations constitute about 15% of the total output of all group processing centres.[6]

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[1] RSH 1968.

[2] C. Barlow, "The Marketing of Smallholders Rubber", Rubber Research Institute of Malaya, 1968.

[3] See also Lim Sow Ching, A Study of the Marketing of Smallholders' Rubber at the First Trade Level in Selangor (Economics and Planning Division of Rubber Research Institute of Malaya, Report No. 4, 1968). Lim describes a hierarchy of dealers. Middle dealers are usually found in larger towns, and often finance first level dealers, who work on a smaller scale.

[4] These centres are operated and used mainly by Chinese. In Selangor 27% of smallholder rubber is processed in GPC's (1963-5) in contrast to less than 6% in all other states. See Voon Phin Kheong, op.cit., pp. 115-6.

[5] Majlis Amanah Ra'ayat - Council of Trust for Indigenous People. This organisation was formerly known as the Rural Industrial Development Authority (RIDA).

[6] See C. Barlow and Lim Sow Ching A Report On the Malay Group Processing Centres 1964 (Statistics Division of Rubber Research Institute of Malaya. Economic Report No. 1 1965), p. 1.

A later development has been the setting up of a number of large central factories buying smallholder latex and scrap for processing into SMR.[1] These factories are the successors to a series of thirteen factories set up by MARA between 1962 and 1965, to produce sheet from smallholder latex. All made severe losses and were closed. Two were re-opened in 1966-67 by the RIIM, converted into SMR factories,[2] and handed over to Malayan Rubber Developments Sdn Bhd.

Most estates process their own latex although a number sell their crops to off-estate latex concentrating factories.[3] FLDA sell all of their latex to outside buyers. They have only one rubber factory (Bilut Valley in Pahang) which processes only scrap, although more factories are planned.[4]

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[1] There are at present (April 1971) five such factories with present capacities of 10-20 tons/day DRC. They are operated by Malayan Rubber Development Sdn Bhd., an organ of the Malayan Rubber Fund Board (interview with MRD, November 1970).

[2] Lim Sow Ching, op.cit., p. 16.

[3] In 1968 over 100,000 tons of processed latex was produced by the off-estate processing sector (see CManI 1968. This is equivalent to 18% of the 1968 estate output. Very few smallholders sell their crops as latex (e.g. 2% of smallholding crop in Selangor - see Lim Sow Ching, op.cit., p. 15, is sold as latex.

[4] Interview, FLDA, October 1970.

V - 1ii Development of the Industry to 1922

The first commercial planting of rubber in Malaya as a separate crop is thought to date from 1896, when five acres of rubber were planted on a European coffee estate in Selangor.[1] By 1922, when exports were restricted and the alienation of rubber land was banned, the estate sector had already achieved almost its present size, in terms of acreage.[2]

Experimental work, carried out mainly by the Straits and Malay States governments, pre-dated commercial planting by twenty years. In 1877 rubber seeds sent from Kew Gardens, England, on the instructions of the British India Office, were planted in the Singapore Botanical Gardens and at the experimental gardens at the Residency at Kuala Kangsar, Perak, started by Sir Hugh Low in that year.[3] By 1896 seeds

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[1] G.G. Allen and A.G. Donnithorne, Western Enterprise in Indonesia and Malaya. A Study in Economic Development, op.cit., p. 110.

[2] 1922 estate acreage was 84% of 1968 acreage. It was 69% of the maximum postwar figure (1953) and 68% of the largest estate acreage recorded (that of 1940). Percentages calculated from Table 7.

[3] General descriptions of the introduction of rubber in Malaya have been given in many works, in particular J.C. Jackson, op.cit. Allen & A.G. Donnithorne, op.cit., Chai Hon Chan, The Development of British Malaya 1896-1909, op.cit. This account borrows heavily from these, together with the AR's of the individual Malay States to 1896, and the AR's of the Resident General/Chief Secretary FMS to 1925.

of the trees at Kuala Kangsar were being distributed to Singapore, Java, and Ceylon, and seeds were being planted experimentally at a number of sites in Malaya with different soils and growing conditions.[1] In 1884-5 the famous administrator Sir Frank Swettenham planted four hundred trees in Perak from Low's seeds, which in turn yielded a good crop of seeds for further cultivation.[2] That this experimental work should have been carried out appears to have depended much on personalities. Men like Low and Swettenham encouraged the early rubber experimentation as part of a desire to promote development in general and agricultural development in particular. More specifically connected with rubber was the work of H.N. Ridley, director of the Singapore Botanical Gardens from 1888. With the encouragement of the director of Kew Gardens Ridley experimented with rubber cultivation, and with methods of tapping which would not permanently damage the trees. By 1897 he had devised the so-called herring bone tapping method, an important technological innovation which greatly facilitated the development of commercial growing. Ridley also was an enthusiastic propogandist of rubber growing, travelling the country to influence planters to grow rubber.[3]

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[1] Chai Hon Chan, op.cit., p. 153.

[2] Sir Frank A. Swettenham, British Malaya. An Account of the Origin and Progress of British Influence in Malaya, op.cit., p. 263.

[3] See for example Chai Hon Chan, op.cit., p. 154.

Rubber was one of a number of crops grown experimentally by government plantations. Others included coffee, tea, and chinchona. Coffee had been grown commercially elsewhere, particularly in Ceylon, while tea and chinchona never achieved much commercial importance. Rubber was the real achievement of government experimentation. By the time commercial planting had started, not only had an efficient tapping system been devised (by Ridley and others in Malaya) but the most suitable variety of rubber, Hevea brasiliensis or Para rubber had been selected.[1]

Rubber was taken up commercially at a time when a number of conditions had been created which facilitated its development. First, there existed a nucleus of estate agriculture. Experienced planters from Ceylon had come to Malaya in the 1870's and early 1880's following the destruction of the coffee industry by disease in Ceylon. Liberian coffee, the variety mainly grown in Malaya, is a crop requiring an investment similar to rubber in that it takes a number of years (three to four) to mature, and yields a return for a period of over twenty years. Thus when coffee prices declined in the late 1890's and the demand for rubber rose, the initial switch by estates from coffee to rubber involved little change in economic organization. In contrast the crops favoured by Chinese planters - gambier, tapioca, pepper, and to a lesser extent sugar cane (which was also grown extensively by Europeans) - yielded quick

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[1] Para not only grew better in the Malayan climate than Castilloa or Caera rubbers, but it produced more regular yields than its main competitor Rambong. See Chai Hon Chan, op.cit., p. 155.

[illegible]

once-and-for-all returns.[1] It is also worth noting that while coffee was grown predominantly by European estates, coffee holdings were also opened by Javenese and Malays,[2] mainly immigrants, and also Chinese and Tamils.[3]

Second, a policy was in existence which favoured agricultural development. In 1888 the Resident of Perak, Sir Hugh Low, declared the government's great desire to encourage settlement by European planters, a policy started by his predecessors.[4] In 1893, Mr. Treacher, Resident of Selangor, felt that few could doubt the desirability:

> "of giving every possible encouragement to agriculture, the soundest basis of permanent prosperity and of continued population in all countries, both among the native and foreign sections of the community."[5]

Encouragement also was to be given to non-European settlers. The Resident of Perak had earlier looked to agricultural development by permanent non-European settlers ("Eurasians, Malays, Chinese, and Javanese") for the main future prosperity of the state.[6] Policy

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[1] Nevertheless, J.C. Jackson, the prime authority on agricultural development in Malaya before rubber, suggests that the importance of coffee can be overrated. It was never of predominant importance, in acreage or value of output, except in Selangor in the 1890's. See <u>Planters and Speculators</u>, <u>op.cit.</u>, pp. 205-6.

[2] See <u>AR</u>'s, Selangor, 1885, 1889, 1893.

[3] See <u>AR</u>, Resident-General FMS, 1896.

[4] <u>AR</u>, Perak, 1888.

[5] <u>AR</u>, Selangor, 1893.

[6] <u>AR</u>, Selangor, 1889.

measures to encourage agriculture included favourable terms for the holding of land,[1] loans to planters,[2] and help in the importation of labour, mainly from India, from 1887.[3]

Third, a pattern of communications already existed, developed largely for the tin industry. Thus much of the early planting of rubber in Selangor was in the Klang valley following the railway built to connect the Kuala Lumpur tin fields with the port of Klang.[4] In fact it was government policy to invest its large mining receipts (mainly in the form of export duty) in the construction of roads and railways, which together with the climate and labour supply, "afforded facilities to planters which probably (were) .... not to be found in most tropical colonies."[5]

From 1896 falling coffee prices were accompanied by rises in the price of rubber. By 1897 many small planters had abandoned their coffee holdings[6] and in 1898 a plague of caterpillars ravaged the industry in

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[1] For example, in Selangor in 1884, all quit rent on agricultural land was waived for three years, and export duties were to be waived for the five years from 1885. See AR's, Selangor, 1884 and 1885.

[2] AR, Perak, 1888.

[3] This included a subsidy to steamers bringing immigrants from Negapatam, India, from 1887, and the establishment of a depot at Negapatam in 1890 where intending immigrants under monetary advances could be examined prior to departure. See R.N. Jackson, Immigrant Labour and the Development of Malaya 1786-1920 (Kuala Lumpur, 1961), especially pp. 96-108. However, the government was also accused of poaching labour from estates for employment in its public works. (See ibid, p. 104-5.)

[4] J.C. Jackson, op.cit., p. 228.

[5] AR, Resident-General FMS, 1900.

[6] AR, Resident-General FMS, 1897.

Selangor.[1] By 1900 coffee prices were so low that only the best estates could cover working costs. By 1902, J.C. Jackson records, almost every coffee estate in Malaya had been interplanted with rubber, and in some cases even mature intercrops such as coconuts were being cut out to make room for the new crop.[2]

An indication of the rate of new plantings of rubber is given in Table 11. Although in absolute terms the figures are not reliable, the rapid increase in plantings after the first rubber boom in 1905 is apparent. By this date the growth of the industry can no longer been

TABLE V - 11 ANNUAL NEW PLANTINGS OF RUBBER IN MALAYA, 1898-1922

	('000 ACRES)		('000 ACRES)		('000 ACRES)
1898	2	1907	73	1915	122
1899	2	1908	85	1916	140
1900	2	1909	79	1917	228
1901	5	1910	207	1918	228
1902	4	1911	209	1919	175
1903	5	1912	192	1920	120
1904	8	1913	132	1921	59
1905	18	1914	94	1922	20
1906	51				
(Total planted acreage		1900 : 6,000 acres		1922 : 2,260,000 acres)	

Sources and Notes: 1) Figures are from D.M. Figart, Plantation Rubber Industry in the Middle East (Washington, 1925), p. 277.

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[1] AR, Resident General, FMS, 1900.

[2] Op.cit., pp. 224-5.

seen in terms of a switch from coffee.[1] Planting gathered momentum to the 1910 boom when the London rubber price reached a peak of 12/9d.,[2] falling to a trough in 1914 following the outbreak of war and poor prices in 1913, with a second peak in 1917-18.[3]

The inputs of capital and labour needed to sustain such increases in acreage came mainly from inflows from abroad in the case of the European estate sector, which by 1921 owned a little over half of the planted rubber area.[4,5] Drabble describes how the large British merchant houses in Singapore, such as Guthries and Harrisons and Crosfield, acted as intermediaries between the industry and the overseas investor. They provided respectability to a venture which might otherwise have seemed too speculative and risky.[6] Additional capital came in early years from rupee companies floated in Ceylon and from a number of dollar companies floated in Singapore and Penang.[7] It is worth briefly trying

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1 In the last full year of the coffee boom, 1895, a total of 539 acres had been planted by European coffee estates in Selangor, the main coffee estate, and 38,000 acres alienated to them. The total acres of new rubber planted from 1906 are quite beyond this magnitude. Average figures from AR Selangor, 1895.

2 See Drabble, *op.cit.*, p. 58.

3 This was in spite of the fact that from 1915 to 1919 it was difficult for British companies to obtain the official permission needed during that period to raise capital. In addition foreign companies were banned from 1917 to 1919 from acquiring new rubber land over 50 acres. See Drabble, *op.cit.*, pp. 64-66.

4 See Table 15.

5 The smallholding and the non-European estate sector is discussed in Subsection 1iv.

6 Drabble, *op.cit.*, pp. 55-56.

7 *Ibid.*, pp. 55-56. A dollar company is one whose issued capital is denominated in dollars. The currency indicates the country in which the company was floated.

to see the size of this capital inflow in perspective. Table 12 gives some crude estimates of annual capital expenditure from 1905 based on simplifying assumptions.[1] Ideally such estimates would be compared to national income. Of course, no national income statistics are available for this period and it is beyond the scope of the present study to calculate them. With higher than average expenditure in the first year

TABLE V - 12 ANNUAL CAPITAL EXPENDITURE ON RUBBER PLANTING IN MALAYA BY THE EUROPEAN SECTOR, 1905-1922

	($M.)		($M.)
1905	1.1	1914	12.6
1906	2.4	1915	11.9
1907	4.0	1916	12.3
1908	5.6	1917	14.3
1909	6.8	1918	13.9
1910	8.9	1919	13.2
1911	11.6	1920	13.4
1912	13.6	1921	13.7
1913	13.7	1922	12.9

Sources and Notes: 1) Assumes capital cost per acre of $175 spread evenly over seven years (of course this is a simplifying assumption. Expenditure would not be spread evenly, and a larger expenditure would be incurred in the first year for clearing). Capital cost figure from Drabble, op.cit., p. 54, and Allen and Donnithorne, op.cit., p. 111, who estimate minimum capital costs to maturity in the early years of the century at £20 an acre. Drabble's costs are also £20 an acre, for 1900. J.C. Jackson, op.cit., p. 248, quotes a 'usual rate of investment' of £25 - £30 to maturity during the 1909-12 boom. However, D.M. Figart, op.cit., pp. 51-2, cites a figure (for 1924) of £61 as the average cost of bringing an acre of rubber to maturity. The cost of expanding from a nucleus (undefined) would be from £26 - £30. Although costs may have risen from the first booms of 1905 and 1910, Figart's figures seem very high, and they are not used here. If cost rises did occur it would probably have been during the years of high rates of land development in 1917-18, hence expenditure figures for those and subsequent years, ceteris paribus, may be understated.
2) New planted acreage in any given year is assumed to give rise to expenditure of $25 per acre over the initial and each succeeding year to year 7. Acreage figures used are those of the European sector from Table 16 below.
3) It is probable that the estimates for 1920-22 are too high. The low prices in those years would have tended to make estates economise drastically on expenditure on immature areas. (But see note 1 with respect to Figart's cost figures).

[1] It is not possible to give estimates for years before 1905 as annual plantings for 1898 and earlier are not known.

of planting it is possible that total expenditure in the boom years reached, say, $15m. as shown in the table. This may be compared to known economic quantities. First, $15m. is equal to about a third of total government revenue in 1912 and a quarter of 1917 revenue.[1] It is equal to 18% and 19% respectively of 1912 and 1917 tin exports.[2] Tin exports were an important component of national income, mainly a Chinese concern. If to the tin export figure is added a rough estimate of the minimum value of output of the Malay population, say $30m. in 1911,[3] the maximum proportion of national income, (excluding the value of rubber exports) represented by European rubber investment is about 13% in the boom year of 1911. Even raising the investment figure to $20m. does not raise the proportion significantly. Since the value of

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[1] Revenue figures from AR, Federal Secretary FMS 1938.

[2] Tin export values calculated from outputs and values in Appendices IV - 1 and IV - 4, respectively, as $85.6m. for 1911 and $78.7m. for 1917.

[3] This is calculated as follows. According to the 1911 Census of the FMS, the "Malaysian" (i.e. Malays + Javanese etc) population was 1.37m. An adult Malay male consumes 4 to 5 pikuls of rice per year (see Chai Hon Chan, op.cit., p. 145). The average 1911 import unit value of rice was $5 per pikul, (see AR Resident-General FMS 1911). If a minimum consumption of rice is taken as 4 pikuls per year, (to allow for the average being lowered by inclusion of females and children), total value of Malay rice consumption is $27.4m. say $30m. This subsistence consumption can be taken, faute de mieux, as an indication of the minimum value of Malay's output. The inclusion of total Malay population is justified by the fact that to the extent that women and children did not work, they would be supported by the male members. Of course, this estimate raises all the problems of valuing subsistence output, and ignores the value of Malay production above the subsistence level, e.g. the growing of coconuts as a cash crop. It does not, however, involve double counting, as little of the Malay output would have been sold to the (mainly Chinese) mining sector. Thus the value of tin output would include few Malay factor services or goods produced by Malays.

additional Malay output, and non-mining Chinese and Indian output might raise further the actual domestic product, it seems probable that the capital inflow represented an investment possibly as low as 10% of domestic product, (excluding the value of rubber exports) a large but not enormous amount. What is more surprising is that an investment of similar magnitude should have been made in the non-European sector from domestic resources. Moreover, from 1912 onwards it is likely that net revenue (i.e. profits) from rubber exports, and probably also even the outflow of dividends, was greater than the inflow of capital. Indeed from the 1912 boom, for the European estate sector as a whole, there was probably no net capital expenditure in the economic sense of a negative cash flow.[1]

The labour supply problem was met by large-scale immigration of Tamils from South India. Various measures had been taken by the government to help foreign recruitment of labourers by planters, but 1907 marks the start of large-scale immigration, with government aid. In 1907 the Indian Immigration Committee was formed, to devise a comprehensive scheme to import labour on a large scale.[2] The Committee was to administer an Indian Immigration Fund, financed by a levy on producers, which would provide passages from South India. Table 13 shows that by the end of the period of unrestricted expansion the workforce was mainly Indian.

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[1] For details of the proportions of gross export receipts accounted for by profits and dividends, see Section 2.

[2] J.N. Parmer, Colonial Labor Policy and Administration, op.cit., p. 39.

TABLE V - 13 RACIAL COMPOSITION OF ESTATE WORKFORCE, FMS 1922

	MADRAS INDIANS	CHINESE	JAVANESE	OTHERS
Total 167,259	78%	17%	3%	3%

Sources and Notes: 1) From AR, Chief Secretary FMS, 1922.
2) 'Others' include Malays.
3) Estates include a small number of estate growing crops other than rubber.

Management and advisory services were in many cases provided by the Singapore merchant houses, or "agency houses" as they came to be called.[1] Development was facilitated by a generous land policy and by loans to planters.[2]

The regional distribution of rubber acreages is shown in Table 14. The concentration on the west coast states, especially Perak, Selangor, and Johore is obvious. Perak and Selangor were areas which already had communications before the rubber boom, while Johore had developed a rail link to the north by 1910. The extensive development in Kelantan relative to the other east coast states is due mainly to the efforts of a particular company, Duff Development, which introduced rubber to that stage and itself planted a substantial acreage.[3]

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1 See Allen & Donnithorne, op.cit., p. 113.

2 See J.C, Jackson, op.cit., pp. 234-241, and p. 252.

3 See J.C. Jackson, op.cit., pp. 222-3.

TABLE V - 14 ACREAGES OF RUBBER BY STATE, MALAYA 1922

	('000 ACRES)		('000 ACRES)
Singapore	44.6	Johore	515.9
Penang	60.3	Kedah	185.7
Malacca	151.4	Perlis	5.0 (1930 figure)
Perak	453.4	Pehang	93.1
Selangor	417.5	Kelantan	112.2
Negri Sembilan	280.0	Trengganu	30.0 (1930 figure)

Sources and Notes: Lim Chong Yah, Economic Development of Modern Malaya, op.cit., p. 330.

V - 1iii) Rubber Restriction

Sharply falling prices from 1920 marked the end of the period of expansion of Malayan rubber.[1] In 1922 the London rubber price reached a low of 6¾d compared to its peak of 12/9d during the 1910 boom.[2]

From November 1922 to September 1928 exports of rubber from Malaya (and Ceylon) were restricted under the so-called Stevenson scheme. From June 1934 exports from virtually all rubber producing countries were restricted under the International Rubber Regulation Scheme. This Scheme, having been renewed in 1938, was still in force when Malay was occupied by the Japanese in 1941.

Much has been written on these restriction schemes and only certain

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[1] It could also be argued, as does J.C. Jackson, op.cit., p. 258, that unfettered expansion came to an end in 1917 when Land Offices could no longer cope with the flood of applications for new land.

[2] For prices see Drabble, op.cit., p. 76.

main points are set out here.[1] The Stevenson scheme restricted output on the basis of a set formula in relation to a standard tonnage based on actual 1920 output, in order to achieve a pivotal price of 1/3d a lb. (raised to 1/9d in 1926). For all but nine months of the restriction period production was restricted to 85% or less of standard tonnage, and for half the period to 60%.[2]

The IRRS, introduced after the Great Depression, restricted output to a percentage of a quota based on 1929-32 output (with provision of increase of quota as immature areas came into bearing), the releases being determined by an International Rubber Regulation Committee. For the first two years of operation quota releases averaged 60%, rising to a peak of 90% in the last quarter of 1937 to a low of 45% in the third and fourth quarters of 1938. The 1939 quotas averaged slightly under 60%.[3] Thus the reduction of output under both schemes was substantial.

The alienation of land for rubber was forbidden under the Stevenson scheme and from August 1930 to December 1938.[4] It was discouraged from 1928 to 1930 by high alienation premiums and by administrative discouragement of alienation to smallholders.[5] New planting, allowed during

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[1] For a discussion of the schemes one of the most useful sources is P.T. Bauer, The Rubber Industry, op.cit., see also Bauer's article "The Working of Rubber Regulation," Economic Journal 1946 and 1948, reprinted in T.H. Silcock (editor), Readings in Malayan Economics, op.cit. A convenient summary of the schemes is given in Lim Chong Yah, op.cit., pp. 76-83.

[2] Lim Chong Yah, op.cit., p. 77.

[3] Quota release figures from AR's, Department of Agriculture, FMS, 1934-40.

[4] Bauer, The Rubber Industry, op.cit., p. 5.

[5] P.T. Bauer, "Malayan Rubber Policy", Political Science Quarterly, 1957, reprinted in T.H. Silcock, Readings, op.cit., p. 303.

Stevenson, was banned from 1934 to 1938. Replanting under the IRRS was allowed up to 20% of planted acreage during the whole restriction period (1934-38) with a maximum of 10% in any one year.[1]

Thus the size of the industry and the distribution of acreage between estates and smallholders were effectively "frozen" from 1922 to the Second World War although some increases in planted acreage occurred as new plantings took place on land already alienated, and limited new planting on newly alienated land occurred from 1939. The effects of restriction on the distribution of the industry between estates and smallholding sectors is discussed in Subsection 1iv.

V - 1iv Development of Local Ownership in the Rubber Industry to the Second World War[2]

By the start of rubber restriction a substantial Asian rubber sector had developed. Table 15 shows that in 1921, the year of the first rubber census,[3] this sector accounted for almost half of Malayan rubber acreage. Over 80% of the Asian acreage was in smallholdings.[4] Nearly

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[1] AR, Department of Agriculture FMS, 1935.

[2] "Local" is used here virtually as a synonym for "non-European" or "Asian". Whether immigrants from China, India, Java and elsewhere are truly "local" is a major issue which recurs throughout this study. It is discussed in Chapter III.

[3] See D.M. Figart, op.cit., pp. 273.

[4] It can be seen from Table 15 that almost all smallholding acreage was Asian. The small European smallholder acreage ("estates under 100 acres") might have consisted of small estates operated by proprietory planters.

90% of the estate acreage was European although by 1932 figures indicate that 25% of estate acreage was in Asian hands (of which over 70% in turn was Chinese).[1]

TABLE V - 15 RUBBER ACREAGES IN MALAYA 1921

('000 ACRES)	ESTATES PLANTED ACREAGE	ACREAGE IN BEARING	SMALLHOLDINGS PLANTED ACREAGE	ACREAGE IN BEARING	TOTAL PLANTED ACREAGE
All Races	1304	822	923	473	2225
European	1148	64	64	40	1212
Asian	157	858	858	473	1015

Sources and Notes: 1) D.M. Figart, Plantation Rubber Industry, op.cit., pp. 274-277.
2)"Smallholdings" are taken here as any holding under 100 acres. Figart distinguishes between smallholdings (which are all Asian) and European "estates under 100 acres". (p. 276).
3) Figart's figures are those of the 1921 rubber census of Malaya.

Even before the turn of the century some Chinese estates had planted rubber.[2] As rubber prices rose in the early 1900's rubber was planted as a catchcrop by many Chinese tapioca and gambier growers.[3] Chinese and (to a lesser extent) Indian capital also entered the industry, especially from tin mining and from trading.[4]

[1] Figures from RSH, 1933, set out in Lim Chong Yah, op.cit., p. 331.

[2] J.C. Jackson, op.cit., p. 221.

[3] Encouraged by a regulation of 1900 in the western Malay states that new land was not to be alienated to gambier and tapioca unless a permanent crop such as rubber or coconut was also planted. See ibid., p. 224.

[4] Drabble, op.cit., pp. 56-7, notes that of the 190 applications for rubber land in Selangor and Negri Sembilan in 1909-10 made by Chinese (165) and Indians (25), 123 were from people described as already having other business interests, particularly tin-mining, shop-keeping, and contracting.

TABLE V - 16 ANNUAL NEW PLANTINGS OF RUBBER IN MALAYA, 1898-1922, BY RACE

('000 ACRES)	EUROPEAN	ASIAN		EUROPEAN	ASIAN
1898	2	-			
1899	2	-	1911	117	92
1900	2	-	1912	97	95
1901	5	-	1913	55	77
1902	4	-	1914	26	68
1903	5	-	1915	40	82
1904	8	-	1916	70	70
1905	18	-	1917	166	62
1906	51	-	1918	102	126
1907	71	2	1919	71	104
1908	69	16	1920	61	59
1909	52	27	1921	38	21
1910	88	119	1922	10	10

Sources and Notes: 1) D.M. Figart, Plantation Rubber Industry, op.cit., p. 277.
2) Figures include new plantings in the small island of Labuan, but not Brunei.

Table 16 gives an indication of the timing of development in the European and Asian sectors, although the figures are unlikely to be very reliable.[1] Unfortunately the data do not distinguish between estates and smallholdings. After the end of the first rubber boom of 1905-8 Asian acreage showed spectacular expansions, reaching peaks during and after the boom periods of 1910-12 and 1915-17, although in the

[1] In particular, no Asian acreage is recorded for before 1907, in spite of many known cases of Asian rubber planting before that date. This point is made by Drabble, op.cit., p. 56.

second case lagging behind the European sectors.[1 2] The tapping and processing skills required for rubber cultivation were easily learnt.[3] Smallholdings were of two main types. Larger holding, often classed as "medium holdings of 25 acres or more", are those which would use outside labour both for establishment and cultivation. No figures are available for the period before the Second World War on individual smallholding size or racial ownership, but it is likely that such holdings would be predominantly Chinese with some Indian participation.[4] These holdings would require outside capital (e.g. from tin mining or trading) of the sort described already in this subsection. The development of smaller holdings below 25 acres, and often below 5 acres was the means by which Malays participated in the boom. M.G. Swift describes

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[1] Voon, op.cit., p. 12, suggests that two reasons for the failure of Asians to take up rubber growing during the first boom were the lack of availability of tapping instruments and uncertainty about the tapping system. After 1910 more economic means of tapping and an abundance of rubber seeds aided smallholder development (p. 13).

[2] Some of the earlier plantings were speculative, intended for sale to Europeans however. See for example AR Perak 1909. This led to the Malay Reservations Enactment of 1913, which forbad the selling of Malay ancestral land to non-Malays.

[3] This point is made in T.R. McHale, Rubber and the Malaysian Economy (Singapore, 1967) p. 66.

[4] The 1952 figures given in Table 10 show that Chinese and Indians own over 80% of holdings of 25-100 acres, while Malays and Chinese own 55% and 35% respectively of holdings under 25 acres. Malays owned 40% and Chinese 47% of total smallholder acreage. Little new land was planted between 1922 and 1953, so these figures will reflect the pre-war position except for transfers of land between racial groups. However, Fryer and Jackson, op.cit., p. 203, suggest that much land may indeed have been transferred to Chinese once the Chinese community became more permanently settled in Malaya after the Second World War. In fact, in their survey of Rasa, only 10% of Chinese holdings had been in their owners' hands for more than 30 years.

how typical holding of 2-4 acres would be cleared and planted with family labour alone using simple tools readily available to the Malay peasants.[1]

The rubber tree fitted well into the Malay economy. It involved little essential work during the immature period, so that the owner could devote himself to other activities. Tapping and processing equipment involved minimal capital outlays.[2] Also, rubber, unlike rice or fruit, provides regular yeilds and income, which reduces the indebtedness frequently incurred before a harvest.[3]

Even less is known about the growth of Chinese ownership of the smaller holdings. Voon notes that in the 1090-10 period most applications for land in the Ulu Langat district of Selangor[4] came from manual workers, and were usually in the 10-15 acre size. He suggests that these workers would have been able to maintain themselves by paid employment during the immature period.[5] Presumably such holdings would have required some outside labour to help in clearing and planting, and implies the prior accumulation of some capital.

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[1] "Capital, Saving and Credit in a Malay Peasant Economy", op.cit., pp. 142-44.

[2] Swift, ibid., p. 144.

[3] Bauer, The Rubber Industry, op.cit., p. 62.

[4] Since the obtaining of this type of information involves detailed study into Land Office records, the case study approach is inevitable. There is little chance of determining how typical was the experience of Ulu Langat. It is certainly in contrast with Drabble's findings discussed above. It was one of the later districts to be developed in one of the most important planting states of Malaya.

[5] Op.cit., p. 19.

Under rubber restriction it is claimed[1] that smallholders were treated unfairly relative to estates. Both under Stevenson and the IRRS their quotas were determined on the assumptions of yields per acre far below their actual capabilities. The restriction on replanting to 20% of total acreage in the 1930's combined with the overall restriction of new replanting during the whole period [2] meant that the smallholders sector was unable to expand to the acreage already reached by estates and was unable to replant.[3] In fact as Bauer concedes, the estate sector did little replanting either, so that the relative efficiency of the two sectors in the long run was not affected.[4]

V - 1v Technological Progress in the Rubber Industry, and the SMR Scheme

Since the early development of the industry technical changes have taken place in a number of areas. In estate cultivation before the Second World War great reductions in both the number of workers and in labour expenditure per acre, with given output, were achieved, particul-

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[1] P.T. Bauer is the most persuasive advocate of this case. His arguments are well set out in "The Working of Rubber Regulation", op.cit. Most later writers have agreed with Bauer's general arguments, though not necessarily his implication of ulterior motivation on the part of the Malayan government. See for example, F.C. Benham, "The Rubber Industry," Economica, November 1949, reprint in T.H. Silcock, (editor), Readings, op.cit.

[2] See Subsection 1iii.

[3] Bauer argues that it is impossible to replant only 20% of a holding of a few acres. The young trees growth would be stunted by the other trees. Also a smallholder might not be able to afford to keep even 20% of his trees out of tapping. In the long run the inability to replant might have meant the extinction of the smallholding sector. See "Working of Rubber Regulation", op.cit., p. 254.

[4] Ibid., p. 254.

TABLE V - 17 OUTPUT PER WORKER AND PER ACRE, AND WORKERS PER ACRE ON RUBBER ESTATES, FEDERATED MALAY STATES AND WEST MALAYSIA, 1915-68 SELECTED YEARS

	OUTPUT PER WORKER (TONS)	OUTPUT PER PLANTED ACRE (TONS)	WORKERS PER PLANTED ACRE
1915	0.20	0.07	0.36
1929	0.56	0.15	0.27
1933	0.89	0.14	0.16
1968	2.71	0.34	0.12

Sources and Notes: 1) Based on employment figures from Appendix V - 2, output figures from Appendix V - 1, and acreages from AR's, Department of Agriculture, FMS, 1915, 29, 33, and RSH 1968. 2) 1915, 1929 and 1933 coefficients are for Federated Malay States. 1968 for West Malaysia. 3) 1915 and 1929 employment figures include a small number of workers on non-rubber estates.

arly in response to the need for cost reductions as rubber prices fell during the Depression of 1929-33. Labour expenditure was reduced not only by cutting wages and salaries, but by increasing the areas supervised by (highly-paid) expatriates.[1] Expatriate staff below the manager rank were replaced by Asians, and expenditure on field workers was reduced by abandoning the practice of clean weeding between the trees, a practice never used on smallholdings and highly conducive to soil erosion.[2] The drastic reduction in workforce per acre during the Depression is clearly shown in Table 17. During the 1929-33 Depression important changes in factory practice also took place. Latex was coagulated in large partitioned tanks instead of small individual tanks, and fed through light sheeting batteries instead of heavy creping rollers.[3]

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[1] Thus Bauer notes that between 1914 and 1932 the average number of acres per European rose from 500 to about 1500. (The Rubber Industry, op.cit. p. 254.)

[2] Ibid., pp. 256-8.

[3] For a more technical discussion of estate factory equipment see Subsection VIII - 2iii.

Table 17 shows that the most important reductions in workforce per acre occurred before the Second World War. Since the war there has been further replacement of European managers by Asians. A development of possible future importance in reducing labour input per acre[1] is the collection of latex in polybags instead of cups. Bags can be collected at intervals of four to five days, thus reducing collection labour although increasing the risk of theft.[2]

Perhaps the most important single technological improvement, increasing both output per man and per acre, has been the development of high yielding varities of rubber.[3] Trees planted in the first two decades of the century yielded on average about 325 lbs per acre.[4] By the 1930's clones were available yielding over 1000 lbs per acre.[5] By 1968 average production per mature acre was nearly 1000 lbs,[6] some clones

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[1] Whether the reduction of labour input per acre is desirable from a national point of view is another matter, in view of the government's intention to promote labour-intensive industries to combat unemployment.

[2] See Chang Wai Pong, N.M. Pillai, and Chin Peng Sung, "Development in Polybag Collection", RRIM Planters' Conference, August 1969.

[3] Research by the RRIM has shown that the proportion of high yielding material is the dominant factor both in the profitability of estates and in the family return to smallholders. For both estates and smallholdings area of holding within a given yield group was not significant in determining costs. See Barlow and Chan, op.cit., p. 21, and Ng Choong Sooi, C. Barlow, and Chan Chee Kheong, "Factors affecting the Profitability of Rubber Production on West Malaysian Estates", Natural Rubber Conference, Kuala Lumpur, 1969, preprint, p. 2.

[4] D.M. Figart, op.cit., p. 185.

[5] Bauer, The Rubber Industry, op.cit., p. 273.

[6] RSH 1968.

in commercial practice were achieving over 2000 lbs per acre[1] and a commercial experimental station was reported in 1969 to have produced a clone yielding over 4000 lbs per acre in its early years and expected to yield eventually over 5000 lbs.[2] High yielding material has achieved practical importance with the new planting and replanting programme started in the 1950's and 1960's. It has normally been a condition of government grants and loans that replanting and new planting should be carried out with approved high-yielding material. By 1968 87% of estate acreage and over 60% of smallholding acreage was planted with high-yielding material.[3] The dramatic increase in output per worker and per acre shown in Table 17 from 1933 to 1968 is mainly due to the use of high yielding material. Yields have also been increased by the use of yield stimulants, although their long term effects on the trees is not certain.[4]

The Standard Malaysian Rubber scheme announced in 1965 combines new presentation and new processing methods.[5] Before the scheme, rubber was graded visually into four grades of ribbed smoked sheet

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[1] Thus in its eighth year of tapping the clone RRIM 600 achieved 2320 lbs per acre. See "Performance of Clones in Commercial Practice". Fifth Report, Planters Bulletin, March 1969, p. 83.

[2] Straits Times, 31 October 1969.

[3] RSH 1968. High yielding material is defined as all clonal seedlings and budgraphs approved by the RRIM. See ibid.

[4] See for instance the RRI's warning on the use of the stimulant Ethrel, Straits Times, 6 August 1970.

[5] Strictly speaking rubber produced by the old processes could be graded and packed as SMR. Only 6% of SMR exports in 1968 were of conventional rubber however. (RSH 1968).

(RSS1 to RSS4) and various kinds of crepes. Under SMR rubber is graded technically, primarily according to its dirt content.[1] Such grading methods are in keeping with those already used in the synthetic rubber industry.[2] Processing methods used under the scheme involve new means of coagulation, coagulum size reduction and drying. Latex is coagulated in steel drums (the Promoci process) or in large concrete tanks (the GEC-AEI process),[3] the coagulum is reduced in size by granulators (which slice the rubber into small pieces) or hammermills (which pound it into small pieces), and dried by air.[4] Scrap can also be handled by SMR processes. SMR factories can handle very large throughputs at comparable

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[1] Thus the grades SMR 5, SMR 20 SMR 50 have 0.05%, 0.20% and 0.50% dirt content respectively. SMR 5L is a rubber of especially light colour, if such is required by the consumer.

[2] L. Bateman, "Natural Rubber in Modern Dress", address to the Rubber Division, American Chemical Society, Miami Beach, Florida, 5 May 1965. (reprinted by RRIM), p. 1.

[3] In the case of a factory converted from sheet production the existing coagulating facilities could be used.

[4] There is much dispute in Malaysia about processing methods, and most of my own information is based on interviews with manufacturers in Malaysia in 1970, (see Subsection VIII - 2iii). The heveacrumb process pioneered by the RRIM, in which castor oil, rather than any mechanical means, is used to crumble the rubber is no longer installed in new factories. Some discussions of processing methods can be found in D.J. Graham and J.E. Morris, "New Processes and the SMR Scheme", Planters' Bulletin, November 1968; D.J. Graham and J.E. Morris, "Manufacture of Heveacrumb", Planters' Bulletin, September 1966; P. Gyss and M. Fleuret, 'Five Years of Nat-Rubber', Natural Rubber Conference, Kuala Lumpur, 1968; W.L. Cuthill and C.G. Osborne, Adaptation of the Hammermill to the Heveacrumb Process", Planters' Bulletin, 1969; M.G. Daumas, "Changing from Conventional to Crumb Rubber Production", RRIM Planters' Conference, August 1969.

costs to sheet production, and SMR grades fetch a premium over RSS.[1] Both granulators and hammer mills were in use for a number of years in other industries (e.g. in plastics and grain milling, respectively) before their introduction into rubber.[2]

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[1] Bateman, op.cit., pp. 1-2 suggests that it was the larger throughputs expected from high yielding new plantings and replantings which were the main impetus to research into new processing methods. SMR processing economises particularly on drying time and capacity.

[2] I am grateful to Mr. E. Findlay of the FLDA, and Mr. C.H. Osborne of GEC-AEI (M) Sdn Bhd for this information (Interviews, October 1970).

Section V - 2 Current Payments Structure of the Estate Sector

This section is set out in similar fashion to that of Section 3 of Chapter IV, where the current payments structure of the tin industry is presented. The presentation is organized around the tables, which give the main data, methods, and references. Detailed calculations and methodology are set out in appendices and the text provides a commentary. As was the case with tin, more data are available for the later 1960's than for earlier years. The period 1964-68 is set out in Subsection i, while Subsections ii and iii trace back some of the main series for the periods 1946-63 and 1906-39 respectively.

V - 2i 1964-68

Data on wage and salary payments, and expenditure on fertilizer, maintenance and new planting by estates are given for 1964-68 in the Rubber Statistics Handbook, published by the Malaysian Department of Statistics.[1] Table 18 is a summary of the Handbook data supplemented by some other series. The importance of labour payments is clear. When labour benefits are included, these payments rise to over 50% for some years. After payment for labour and materials, and after deduction of duty and the research cess, a residual of 30% to 40% is left before any expenditure on the immature area.[2]

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[1] For earlier years it gives only payments to labour and these only for 1962 and 1963.

[2] It would not be correct to aggregate immature area expenditure and the replanting cess (a sort of forced depreciation allowance) since the former is partly financed from refunds of the latter.

TABLE V - 18

CURRENT PAYMENTS STRUCTURE OF RUBBER ESTATE SECTOR WEST MALAYSIA, 1964-68

			CURRENT PAYMENTS AS PERCENTAGE OF ANNUAL VALUE OF OUTPUT									
	(i) VALUE OF ESTATE OUTPUT ($000)	(ii) OUTPUT UNIT VALUE (CENTS PER LB)	(iii) TOTAL PAY-MENTS TO LABOUR	(iv) ESTIMATED VALUE OF LABOUR BENEFITS	(v) EXPENDITURE ON FERTILIZER FOR MATURE ACREAGE	(vi) EXPENDITURE ON FERTILIZER FOR IMMAT-URE ACREAGE	(vii) MAINTENANCE EXPENDITURE ON IMMATURE RUBBER	(viii) EXPORT DUTY	(ix) RESEARCH CESS	(x) REPLANT-ING CESS	(xi) TRANSPORT CHARGES TO PORT	(xii) GROSS PROFITS BEFORE TAX: (100) - (iii + iv + v + viii + ix + x + xi)
1964	748,755	70.1	47.0	6.1	1.4	1.7	7.1	5.2	1.0	6.1	0.8	32.4
1965	774,199	70.4	42.7	5.8	1.6	1.8	6.7	5.6	1.2	6.0	0.8	36.3
1966	781,553	67.9	42.3	5,3	2.0	1.6	6.1	4.7	1.2	6.3	0.8	37.4
1967	677,203	57.5	46.0	5.7	2.2	1.4	5.7	3.5	1.6	7.4	0.9	32.7
1968	683,577	54.2	41.4	5.0	1.1	1.0	3.6	3.7	1.8	8.0	...	39.0

Sources and Notes: 1) Column i is output figures from Appendix V - 1 multiplied by Unit Value of ii. For calculation of ii see Appendix V - 4. The output unit value is in effect the unit value of exports (see Appendix V - 4).

2) Columns iii and v to vii are calculated from RSH 1964-1968. Column iv is calculated from data in Rubber Research Institute of Malaya, Guide to Estate Management (Kuala Lumpur 1968) p. 30.

3) Export duty and cesses are calculated from Monthly Statistical Bulletin, Rubber Producers' Council of Malaya, November 1969.

4) Column xi calculated from Appendix V - 7. Assumes all costs of transport per ton are the same as rail costs per ton.

5) Some proportion of labour payments will be for maintenance on immature acreage. Column vii, which would also include maintenance materials, indicates the maximum amount of such expenditure. Columns vi and vii represent capital expenditure and are not deducted in the calculation of column xii. Column x can be thought of as a sort of compulsory depreciation allowance.

A more detailed breakdown of the estate current payments is available from the 1964 survey of estates in West Malaysia carried out by the Rubber Research Institute, set out in Table 19.[1] The expenditure on labour by estates in the survey is slightly lower than in Table 18 for 1964. It would be slightly lower still if the Table 19 costs were calculated as percentages of export unit values (70.1 cents per lb.) instead of the gross amount received by estates (64.8 cents per lb.) This is to be expected in view of the bias of the RR1 sample towards more efficient estates.[2] Materials in the survey amount to a little over 10% of gross output, leaving a residual of over 30%.

Public companies produce over half of West Malaysian estate output.[3] As a check on the <u>Rubber Statistics Handbook</u> and RRIM <u>Survey</u> results, the summarized annual reports of 80 public rubber companies were examined, and average profits, dividends, taxes and net replanting and new planting expenditures were calculated, the results of which are given in Table 20. The profits figures are after payment of duty and research cess,[4] and after expenditures on new planting or immature areas. Adding net new planting and replanting expenditure to profits gives a residual of over 30% in 1968 for all companies covered. Taxes are predominantly Malaysian since almost all UK tax is refunded under a double tax agreement.

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[1] This survey represents the RR1's first attempt to acquire widespread economic data on estates. Before 1962 the RR1 was expressely forbidden to conduct economic research (interview with head of Economics and Planning Division of RR1, October 1969).

[2] See Table 19, note 4.

[3] 55.6% in 1968. See <u>RSH</u> 1968.

[4] Replanting cess is paid by estates but refunds are credited to profits or revenue.

The much higher profits of UK-incorporated multicrop companies may reflect higher profits from oil palm, the main alternative crop, but also reflect the fact that it is many of the largest and most efficient companies who have diversified into oil palm.[1] The similarities in profits, taxes and dividends of UK and Malaysian incorporated companies are apparent. Because of this, and because of the predominance of UK companies in total output, figures have not been calculated for dollar companies for earlier years.

Other information on companies is available from the 1967 Survey of Limited Companies published by the Statistics Department of Malaysia, data from which are given in Table 21. This survey covers both private and public companies. In addition, Table 21 gives an estimate of payments by unincorporated estates. Profits for foreign-incorporated companies, mainly British, are slightly lower than in Table 20, and those for Malaysian-incorporated companies are strikingly lower than those of dollar public companies in Table 20. The low profit figure of foreign-controlled Malaysian companies is most surprising since they might be expected to have similar performance to those of public dollar (i.e. Malaysian-incorporated) companies. Table 20 shows that profits of the

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[1] These include the Guthrie Corporation, the Highlands and Lowlands group, the Seafield group, and Kuala Lumpur-Kepong Amalgamated. Efficiency here refers mainly to the proportion of high-yielding material planted. Thus the 1968 unweighted mean yield per acre of the four groups mentioned is 1074 lbs., in comparison to a 1968 yield of 986 lbs. per acre for all estates. See Zorn and Leigh-Hunt, Manual of Rubber Planting Companies 1969, op.cit., pp. 53, 57, 69 and 121, and RSH 1968.

TABLE V - 19 CURRENT PAYMENTS STRUCTURE OF RUBBER ESTATE SECTOR, WEST MALAYSIA: RUBBER RESEARCH INSTITUTE OF MALAYA DATA, 1964

	CENTS PER LB	% OF GROSS REVENUE
Gross Revenue	64.8	100.0
Total Costs	38.7	59.7
Export Duty	3.9	6.0
Research Cess	0.7	1.1
Gross Profits after Duty and Cess	21.5	33.2
Cost Items		
1. Tapping and collection		
Labour	21.6	33.3
Materials	0.4	0.6
2. Processing		
Labour	2.5	3.9
Materials	1.9	2.9
3. Management	5.1	7.9
4. Other costs		
Weeding		
Labour	1.5	2.3
Materials	0.6	0.9
Manuring		
Labour	0.1	0.2
Materials	1.2	1.8
Field Maintenance		
Labour	0.7	1.1
Materials	0.1	0.2
Transport	1.6	1.5
Pest and Disease Control	0.2	0.3
Latex Stimulation	0.1	0.2
Miscellaneous (land taxes, insurance, water, electricity, etc.)	1.7	2.6
Cost Summary		
Estimated Total Labour Costs	26.5	40.9
Labour + Management	31.6	48.8
Labour Benefits, included in Labour Costs	3.9	6.0

Sources and Notes: 1) Cost and revenue figures from Chan Chee Kheong, Ng Choong Sooi, and C. Barlow, Results of 1964 Sample Survey of Estates in West Malaysia (Rubber Research Institute of Malaya, Kuala Lumpur, 1969).
2) Breakdowns of certain items in 4, Other Costs, and also Labour Benefits, are from Ng Choong Sooi, Colin Barlow, and Chan Chee Kheong, 'Factors Affecting the Profitability of Rubber Production on West Malaysian Estates, op.cit., p. 5. This article describes the 1964 Survey.
3) The labour content of 4, Other Costs, for which a labour/materials split is not available has been assumed arbitrarily at 0.1 cents per lb. The assumption makes little difference to the overall magnitudes.
4) The RRI sample represented 14.7% of the number of estates and 10.2% of the estate acreage of West Malaysia. The selection method is likely to have introduced a bias towards above average performance. (Ibid., pp. 1-2).

latter are as high as for UK companies.[1] Dividends in foreign companies in Table 21 are much higher than in Table 20, and conversely tax payments are lower. The main difference in the two sets of data lies in the very large item Purchases of Goods and Services in Table 21 which has no counterpart elsewhere. This discrepancy is best left to be discussed below in connection with Table 25 which attempts to break down estate payments into their foreign and local components. For convenience, some comparisons of data presented so far are given in Table 22.

Before estate payments can be split into their local and foreign components, it is necessary to know the relative shareholdings of Malaysians and foreigners in the sector in order to determine the foreign/local split of dividend payments. The 1967 Survey of Limited Companies gives the proportion of issued capital owned by Malaysian residents in Malaysian-incorporated companies (public and private), as set out in Table 24.[2]

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[1] Although Table 20 refers to 1968 and Table 21 refers to 1967, there is more comparability than might be thought because in Table 20 "1968" refers to the financial year 1967-8.

[2] More detailed information on shareholdings in Malaysian public rubber companies is given in R.K. Mamajiwala, "Ownership and Control of Public Rubber Companies Incorporated in the Federation of Malaya 1948-58" (University of Malaya, M.A. thesis, Kuala Lumpur, 1963). Mamajiwala found that from 1948 to 1963 the proportion of issued capital held by residents of Malaya (and Singapore) rose from 45.5% to 58.3%, and to 69.7% in 1958. Over the same period the proportion of issued capital held by Europeans (including European residents of Malaya and Singapore) fell from 75.6% to 57.8%, to 40.3%. (See pp. 23-24). Mamajiwala suggests that as share prices rose during the Korean boom, Europeans took their chance to sell out, their commitment to Malaya having been weakened by war and the Emergency (pp. 402-410).

TABLE V - 20 PROFITS, TAXES, DIVIDENDS, AND PLANTING EXPENDITURES OF PUBLIC RUBBER COMPANIES IN WEST MALAYSIA, 1968 AND 1964

	(i) NUMBER OF COMPANIES	(ii) ANNUAL VALUE OF OUTPUT ($ MIL)	(iii) ANNUAL VALUE OF RUBBER OUTPUT ($ MIL)	(iv) PRE-TAX PROFITS AS % OF ii	(v) TAX AS % OF ii	(vi) DIVIDEND AS % OF ii	(vii) NET NEW AND REPLANTING EXPENDITURES AS % OF ii
1968 (RSS 1 Price = 53.1 cents/lb)							
1. UK-Incorporated Companies							
Rubber Companies	48	101.4	101.4	22.7	6.3	10.9	7.8
Multicrop Companies	10	269.7	185.9	32.4	12.4	15.0	4.0
Rubber + Multicrop Companies	58	371.9	287.4	29.7	10.7	13.8	5.1
2. Malaysian-Incorporated Companies							
Rubber Companies	18	31.6	31.6	26.1	6.9	10.5	2.2
Multicrop Companies	4	50.7	32.3	25.6	5.6	11.9	0.5
Rubber + Multicrop Companies	22	83.0	63.9	25.8	6.1	11.4	1.1
3. Malaysia + UK-Incorporated Companies	80	454.2	351.3	29.0	9.9	13.4	4.4
1964 (RSS 1 Price = 68.1 cents/lb)							
UK-Incorporated Companies							
Rubber Companies	57	163.0	163.0	25.4	7.0	11.0	8.5
Multicrop Companies	7	136.4	101.2	37.3	12.4	15.4	4.4
Rubber + Multicrop Companies	64	299.4	264.3	30.8	9.5	13.0	6.7

Sources and Notes: 1) Data on UK Companies compiled from Zorn and Leigh-Hunt, Manual of Rubber Planting Companies, (London, 1969 and 1967). Data on Malaysian companies compiled from Stock Exchange of Malaysia and Singapore, Handbook of Malaysian and Singapore Companies on the Official List, Volume IV, (Singapore 1970).
2) RSS 1 prices from Appendix V - 3.
3) Intervening years between 1964 and 1968 have not been calculated as calculation involved the extremely tedious procedure of summing profits, taxes, etc., company by company.
4) Pre-tax profits are profits after payment of export duty and research cess (for details of which see Table 18).
5) A small number of companies have been excluded, e.g. because their accounts were incomplete.
6) Net new and replanting expenditure is expenditure in addition to that financed by refunds of the replanting cess. Certain ambiguities in the figures on this item for 1968 dollar companies make replanting and new planting figures for the latter unreliable.
7) Output figures from the manuals are multiplied by unit values of net exports to arrive at Column ii annual values. Rubber unit values from Appendix V - 3. Oil palm and copra unit values calculated from MBS July 1970 are used to value non-rubber outputs.

TABLE V - 21

CURRENT PAYMENTS STRUCTURE OF PRIVATE AND PUBLIC RUBBER COMPANIES IN MALAYSIA, 1967; SURVEY OF LIMITED COMPANIES DATA

	ITEMS AS PERCENTAGES OF ANNUAL REVENUE FROM SALES OF GOOD AND SERVICES				
	(i) MALAYSIAN INCORPORATED LOCALLY CONTROLLED COMPANIES	(ii) MALAYSIAN INCORPORATED FOREIGN CONTROLLED COMPANIES	(iii) FOREIGN INCORPORATED COMPANIES	(iv) TOTAL i TO iii	(v) TOTAL + ESTIMATED VALUES FOR NON-LIMITED LIABILITY ESTATES
Current Profits before Direct Tax, and after Duty and Indirect Tax	11.4	11.4	26.9	20.7	18.9
Duty and Indirect Tax	4.2	6.5	7.3	6.5	6.0
Direct Tax	5.5	3.0	8.2	6.6	6.4
Salaries and Wages (including Contract Labour)	38.4	41.2	37.5	38.4	38.4
Purchases of Goods and Services	49.6	35.6	27.0	31.8	35.3
Depreciation and Depletion	4.1	4.3	5.4	5.0	4.8
Dividends Paid	6.8	6.3	21.1	14.9	12.0
Payments to Overseas Shareholders	1.6	8.2	...	...	...
Retained Profits	-0.9	2.0	...	...	...
Revenue other than from Current Sales	13.9	1.6	5.5	5.9	4.7
Annual Revenue from Sales of Goods and Services	\$86.1m.	\$109.1m.	\$345.5m.	\$540.7m.	\$677.0m.

Sources and Notes: 1) All items in columns i to iv are from Report on the Financial Survey of Limited Companies Malaysia 1967.
2) In 1967 79.2% of rubber estate acreage and 85.2% of rubber estate production was accounted for by public and private limited companies, (RSH 1967). Estimates for the remaining (non-limited liability) estates, in column v, assume that they have the same payments structure as those of column i (Malaysian incorporated, locally controlled companies), except that they are assumed to have no foreign dividend payments and no income other than that from current sales. The value of output in column v is from Table 18.
3) A locally controlled company has Malaysian ownership of over 50% of its voting shares, and a foreign controlled company less than 50%.
4) For foreign-incorporated companies "dividends paid" are assumed in the absence of more detailed information to be equivalent to "investment income accruing to Head Office" in Appendix Table F of the Survey.
5) 'Current profits' include 'other revenue'.

TABLE V - 22 RUBBER ESTATE CURRENT PAYMENTS DATA RECONCILIATION

(Items as percentages of gross value of output)

SOURCE OF DATA	(i) WAGES AND SALARIES BILL	(ii) PROFITS AFTER EXPORT DUTY AND RESEARCH CESS AND BEFORE DIRECT TAX (a) FOREIGN COMPANIES	(b) ALL ESTATES
1964			
Rubber Statistics Handbook (Table 18)	47.0	...	38.5
Rubber Research Institute Survey (Table 19)	48.8	...	33.2
UK-incorporated Public Companies data (Table 20)	...	30.8	...
1967			
Rubber Statistics Handbook (Table 18)	46.0	...	38.4
UK- and Malaysia-incorporated Public Companies Data (Table 20)	...	29.7	29.0
Survey of Limited (Public and Private) Companies (Table 21)	38.4	22.5	18.9

Sources and Notes: 1) All figures from, or calculated from Tables 18 to 21.
2) Survey of Limited Companies 'All Estates' profits figures includes estimates made in Table 21 of profits of non-incorporated estates. Also, the 'foreign companies' include 'foreign controlled' locally incorporated estates. The profits figure for foreign incorporated estates alone is 26.9%, which is much nearer the Table 20 figures. The Table 20 'foreign companies' may exclude a minority of Malaysian registered public companies in which foreigners have the majority shareholding.
3) Table 20 data quoted for 1967 are in fact for the financial year 1967-68, quoted in Table 20 as 1968.

To determine the proportion of capital held by Malaysians in foreign incorporated companies, a postal survey of UK-incorporated rubber companies was conducted in March-April 1971, whose results are set out in Table 23 and described at greater length in Appendix V & 5.[1]

[1] UK-incorporated companies from the bulk of foreign rubber companies operating in Malaysia. Thus the UK companies in Table 20 have an output of rubber equal to 83% of the total output of foreign-incorporated companies in Table 21.

UK rubber companies were found to have a rather low average Malaysian shareholding, although a minority of companies had Malaysian holding of 40-60%. This is in contrast both to Malaysian rubber companies and to the tin dredging companies discussed in Chapter IV.[1] The sample is sufficiently large relative to the population for a high degree of accuracy to be expected from the results.[2]

Table 25 brings together the information so far presented in an attempt to show the proportion of export income retained locally. Because of the discrepancy in the Materials (and Services) item between the Table 21 and the other sources, Table 25 is divided into two parts, a and b. In part a Materials and Services are a large item unallocated between foreign and local payments, the result of which is a large difference in Gross Profits (24.9% and 51.0%) between parts a and b. The discrepancies can be largely reconciled, however. The difference in gross profits between a and b is 26.1% points. Part b's Allocation of Gross Profits includes the replanting cess and net new-and replanting expenditures which a's does not, totalling 11.8% points.[3] If payments to contractors for new and replanting operations are included in a's

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[1] See Table IV - 18.

[2] See Table 23, note 5.

[3] It is not stated in the Survey of Limited Companies that duty and indirect tax does not include the replanting cess. However, since export duty and research cess along in b are 5.1%, and duty and indirect tax in a are 6.0% there are good grounds for supposing the replanting cess not to be included in a's allocation of gross profits.

Materials, and if the 5.6% points Unallocated Items (column ii) difference between a (0.5%) and b (6.1%) are materials purchases or other costs of b, the Gross Profits discrepancy is reduced to 8.7% points. This

TABLE V - 23 SAMPLE DATA ON MALAYSIAN SHAREHOLDINGS IN UK-INCORPORATED MALAYSIAN RUBBER COMPANIES, 1971

(i) NUMBER OF COMPANIES IN SAMPLE	(ii) TOTAL 1967 RUBBER TOTAL OUTPUT OF SAMPLE COMPANIES ($M)	(iii) MEAN PERCENTAGE MALAYSIAN OWNERSHIP	(iv) ABSOLUTE MINIMUM PERCENTAGE MALAYSIAN OWNERSHIP	(v) MINIMUM PERCENTAGE OWNERSHIP AT 5% LEVEL	(vi) MAXIMUM PERCENTAGE OWNERSHIP AT 5% LEVEL
31	210.9	6.68	5.26	4.13	9.23

Sources and Notes: 1) Data from postal survey conducted March-May 1971. See Appendix V - 5.
2) Confidence limits calculated at 5% level of significance using Student t distribution, and finite population correction factor. These limits should be treated with circumspection since the sample is not truly random (see Appendix V - 5).
3) Ownership refers to the percentage of the current (1971) value of issued capital owned by Malaysian residents.
4) The sample represents exactly half of the UK incorporated companies listed in Zorn and Leigh-Hunt, op.cit. 1968. The 1968 output of the sample companies was 69% of all Zorn and Leigh-Hunt companies' total 1968 rubber output (including $12m. output of the Zorn and Leigh-Hunt Malaysian companies excluded from Table 20). The sample companies' 1967 output was 61% of the output of all rubber companies incorporated outside Malaysia, as shown in Table 21. The current value of the 31 companies' issued capital was 78% of that of all Zorn and Leigh-Hunt rubber companies operating in Malaysia.
5) The absolute minimum possible Malaysian shareholding (5.26%) is calculated by assuming that the non-sample UK companies (with 22% of total issued capital) have no Malaysian shareholders, and weighting all shareholdings by issued capital. Since this is above the lower confidence limit at the 5% level, the latter is rendered inoperative and is shown for interest only. The maximum shareholdings would be 26.81%, if the non-sample companies had 100% Malaysian share ownership.

remaining difference can be accounted for by genuine differences in profitability between the a and b groups. Tax and dividend payments are 4.9% points higher for b than a. In any case, the difference in pre-tax profits between companies in Table 20 (b companies) and 21 (a companies) was over 10%.[1]

TABLE V - 24 COMPARISONS OF SHAREHOLDINGS IN MALAYSIAN-INCORPORATED, AND UK-INCORPORATED RUBBER COMPANIES, AND UNINCORPORATED ESTATES

	(i) % VALUE OF SHAREHOLDING OWNED BY PRIVATE RESIDENTS OF MALAYSIA	(ii) 1967 DIVIDEND ($M.)	(iii) VALUE OF 1967 OUTPUT ($M.)
Malaysia-incorporated Companies (Public and Private)	45.1 (1967)	12.8	195.2
Non-incorporated Malaysian Estates	100.0 (ownership of assets)	8.0 (profits after all taxes and duties)	136.3
UK-incorporated Companies (Public only)	6.7 (1971)	70.5 (all foreign-incorporated companies)	345.5
All Malaysian Estates	20.3	91.3	677.0

Sources and Notes: 1) Shareholdings in Malaysian-incorporated companies from FSLC. All figures in columns ii and iii from Table 21. Shareholdings in UK companies are from Table 23. Virtually all UK-incorporated rubber companies are public. Over 80% of the rubber acreage of foreign incorporated companies in Malaysia is owned by UK companies. See D.W. Fryer, 'The Plantation Industries', in Wang Gungwu, op.cit., p. 238. The dividend figure for UK companies is subject to qualification set out in note 4 of Table 21.
2) Shareholdings in Malaysian-incorporated companies are expressed in terms of the par value of issued capital. Shareholdings in UK companies are expressed in terms of the current (1971) value of issued capital. See Appendix V - 5.
3) To estimate the overall Malaysian shareholding, the individual sectors' shareholdings are weighted by dividends (column ii). This weighting procedure is used instead of weighting by value of issued capital, since no information on the capital value of unincorporated estates is available. (Issued capital values tend to reflect past and expected dividends).

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[1] In Table 25 profits are calculated as a residual, using Table 18 and 19 data to determine costs. The tax, dividend, and new and replanting expenditures are then taken from the Table 20 companies data. The difference in pre-tax profits between the Table 20 and 21 companies is not directly incorporated into Table 25 therefore.

TABLE V - 25 LOCAL AND FOREIGN PAYMENTS OF RUBBER ESTATE SECTOR, WEST MALAYSIA, 1967

(Items as percentages of gross value of output)

	(i) DATA SOURCE OF COLUMN ii	(ii) TOTAL	(iii) LOCAL	(iv) FOREIGN	(v) UNALLOCATED
a) With Survey of Limited Companies Data					
Costs	(Table)				
Wages	21	38.4	32.1	6.3	-
Materials and Services	21	35.3	-	-	35.3
Depreciation and Depletion	21	4.8	4.8	-	-
Other Costs	21	1.3	-	-	1.3
Allocation of Gross Profits (24.9% including 4.7% Other Receipts)	21				
Duties and Indirect Taxes	21	6.0	6.0	-	-
Direct Taxes	21	6.4	6.4	-	-
Dividends	21	12.0	2.4	9.6	-
Unallocated Items		0.5	-	-	0.5
TOTAL		104.7	51.7	15.9	37.1
b) With Other Data					
Costs					
Wages (less 5.7% maintenance expenditure on immature areas)	18	40.3	33.7	6.5	-
Labour Benefits	18	5.7	5.7	-	-
Materials	19	12.4	6.2	6.2	-
Allocation of Gross Profits (51.0% including 4.7% 'Other Receipts')					
Export Duty	18	3.5	3.5	-	-
Research Cess	18	1.6	1.6	-	-
Replanting Cess	18	7.4	7.4	-	-
Tax	20	9.9	9.9	-	-
Dividends	20	13.4	2.7	10.7	
Net Replanting and New Planting Expenditures	20	4.4	4.4	-	-
Unallocated Items		6.1	-	-	6.1
TOTAL		104.7	75.1	23.4	6.1

Sources and Notes: 1) All items in column ii are from sources listed in column i. Unallocated items in column ii are the residuals of total revenue and other income (104.7%) less the total of Cost and Allocated Gross Profit items.

2) In parts a and b of Table, data split between local and foreign as follows:- Part a Wages - all management is assumed foreign, and proportion of management salaries in wages and salaries bill is the same as that in the RRIM 1964 Survey of Estates, op.cit. (Table 19). Depreciation and Depletion - assumed to be retained locally, though may subsequently be remitted abroad. Duties and Indirect Taxes are those levied by Malaysian government. Direct taxes may include a small element of overseas taxes but are mainly Malaysian taxes. UK taxes paid are remitted to UK companies in Malaysia under double taxation relief. Dividends are split according to local shareownership (and asset ownership in the case of non-incorporated estates), given in Table 24. Part b - Wages, Duties, Cesses, Tax and Dividends split as in part a.

Materials are split according to a priori information on materials items in Table 19. Much tapping equipment, many chemical fertilizers and weedicides, and coagulating acid are made locally (see Section 3). It is assumed here that at least half of Materials therefore are local.

New Planting and Replanting Expenditure is local in the first instance.

The Table 25 b data give a clearer indication of the foreign/local split. Over 75% of rubber industry current payments are retained locally, the main outflow being dividends. Moreover expatriate salaries are subject to Malaysian income tax, which would increase the local share by several percentage points. The expatriate salaries item is also likely to be overstated to the extent that estate managers are now Malaysian.

V – 2ii 1946-63

Table 27 sets out the available time series with which the analysis in Subsection 2i can be carried back to the Second World War. The main series is that of wages, the compilation of which is shown in Appendix V – 6. Wages and employment statistics are available from Ministry of Labour sources. Table 26 compares these to the wages and salaries bill from the Rubber Statistics Handbook. The closeness of the two series is clear both in terms of absolute value and annual changes. The residual gross profit (column ix) in Table 27 is of course larger than in the Subsection 2i tables because the input series are less compreh-

TABLE V – 26 RECONCILIATION OF WAGE DATA FROM RUBBER STATISTICS HANDBOOK AND MINISTRY OF LABOUR SOURCES, 1964-68

(Wages as Percentage of Annual Value of Output)

	(i) RSH WAGE BILL	(ii) M OF L WAGE BILL
1964	47.0	46.8
1965	42.7	43.0
1966	42.3	...
1967	46.0	45.8
1968	41.4	42.2

Sources and Notes: 1) Column i from Table 18. Column ii calculated from wages in Appendix V – 6.

TABLE V - 27 RUBBER ESTATE SECTOR, WEST MALAYSIA, CURRENT PAYMENTS STRUCTURE, 1946-63

Current Payments as Percentages of Annual Value of Output

	(i) VALUE OF ESTATE OUTPUT ($MIL)	(ii) OUTPUT UNIT VALUE (CENTS/LB)	(iii) TOTAL WAGE BILL	(iv) EXPORT CESS	(v) RESEARCH CESS	(vi) REPLANT-ING CESS	(vii) SCHEDULE II REPLANTING CESS	(viii) ANTI INFLATIONARY CESS	(ix) TRANSPORT COSTS TO PORT	(x) (100) - (iii to ix)
1946	...	...	...	...	...	-	-	-	...	...
47	310.3	38.5	82.0	5.2	-	-	-	-	1.3	11.5
48	390.9	43.3	55.6	4.7	0.5	-	-	-	1.3	37.9
49	345.0	38.5	50.9	4.6	0.7	-	-	-	1.3	93.4
1950	918.5	109.1	...	4.7	0.4	-	-	-	0.5	...
51	1,240.8	168.9	28.2	8.2	0.2	-	1.9	1	0.4	61.1
52	736.5	96.4	40.6	8.4	0.4	3.3	1.6	-	0.6	45.1
53	524.9	68.7	48.5	6.0	0.7	6.2	0.5	-	0.9	37.2
54	522.9	67.7	47.5	5.7	0.7	6.2	0.5	-	...	39.4
55	1,264.5	109.7	32.7	10.8	0.4	3.8	-	3.0	0.8	48.5
56	766.2	97.5	40.0	10.2	0.5	3.4	-	0.7	0.5	44.7
57	751.6	91.2	41.8	9.0	0.5	2.1	-	0.1	0.6	45.9
58	698.7	80.1	45.3	7.3	0.8	2.3	-	-	0.7	43.6
59	915.7	100.4	35.0	10.5	0.7	1.8	-	1.0	0.8	50.2
1960	1,012.6	109.4	37.4	10.4	0.6	3.7	-	2.1	0.6	45.2
61	804.6	83.9	41.1	8.0	0.8	4.8	-	-	0.5	44.8
62	780.4	79.5	44.0	6.6	0.9	5.1	-	-	0.7	42.7
63	765.8	74.6	42.5	5.9	0.9	5.6	-	-	0.7	44.4

Sources and Notes: 1) Column i is derived from output figures for Appendix V - 1 multiplied by output unit values (column ii).
2) Column iii is calculated from data in Appendix V - 6. It does not include labour benefits.
3) Export duties and cesses are calculated from Monthly Statistical Bulletins of Rubber Producers' Council of Malaya, various issues from 1947 to 1964.
4) Column ix is calculated from data in Appendix V - 7.

ensive. Again, the importance of wage and salary payments is clear. If labour benefits were added, say 5% points, usually 40-50% of export income is spent on labour. In years of very high rubber prices, such as 1951 and 1955, the labour share drops, but a ratchet effect suggests itself in the years which follow, as wages, pushed up by union pressure, maintain at least part of their higher value as prices fall.[1 2] Export duties, on a sliding scale, have taken as much as 10% of export earnings in years of high prices.

Table 28 shows profits and dividends in UK-incorporated rubber companies for the boom year of 1951 and for 1958. Even in 1951 profits were below 40% of annual output and up to 30% of profits would have been channelled back into Malaysia in tax.

Thus, from the early 1950's the payments structure shown by Tables 27 and 28 appears similar to that in 1964-68. In 1951 and 1957 profits are slightly higher than either 1964 or 1968, as shown in Table 20, but in both cases the rubber price is substantially higher. From 1952 the wage bill also is similar to that of later years, falling below 40% only in years of very high prices. In 1955, 1959 and 1960, when wages were

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[1] For a history of trade unionism in the rubber industry see C. Gamba, The National Union of Plantation Workers (Singapore 1962). Also A.M.F. Gul, "Wages and Prices with reference to the Rubber Industry in West Malaysia" (University of Malaya BA Graduation Exercise, Kuala Lumpur, 1967-8).

[2] Since 1958 estate wages have consisted of two elements: a cost of living, or basic, element, together with a price element which increases as the rubber price rises. See Gul, op.cit., p. 27. However, see Section VII - 2 for an estimate of rubber industry export multipliers, which suggest that there is little connection between rubber export earnings and wage payments.

from 32% to 37% of output, prices in each case were over 100 cents per lb. Detailed data on non-labour inputs are not available to allow a calculation of the local/foreign payments split. Unless there were significant changes in non-labour inputs, which from the available qualitative information seems unlikely,[1] the local retention of export earnings would be similar to 1967, except in years of very high prices when the dividends outflow would be higher. The outflow would also be greater because of lower local shareholdings in the earlier years. Since overall local share-holdings in foreign incorporated companies are still low at present, and since the growth of local ownership in local companies is not of great quantitative importance,[2] the proportion of dividends flowing out of the country in the early 1950's is likely to have been at most 10% more than in 1967. This difference represents only 2% points of export income (assuming dividends to be as much as 20% of gross output value.)[3]

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[1] See Subsection 1v.

[2] Such companies accounted for only 29% of 1967 output and 14% of 1967 dividends.

[3] The 10% increase is arrived at as follows: In 1967 45% of Malaysian-incorporated companies' capital was locally owned and these companies accounted for 14% of dividends. If local ownership were zero (an extreme assumption since many of the companies were private) dividend outflow would increase by 6% points. 10% is assumed in order to take account of the fact that in early post-war years replanting had yet to give foreign companies their present dominant advantages.

TABLE V - 28 PROFITS AND DIVIDENDS OF UK-INCORPORATED PUBLIC RUBBER PLANTING COMPANIES IN MALAYA, 1951 AND 1957

	(i) NUMBER OF COMPANIES	(ii) ANNUAL VALUE OF OUTPUT ($MIL)	(iii) ANNUAL VALUE OF RUBBER OUTPUT ($MIL)	(iv) PRE-TAX PROFITS AS % OF ii	(v) DIVIDEND AS % OF ii	(vi) NET NEW PLANTING AND REPLANTING EXPENDITURE AS % OF ii
1951 (RSS 1 Price = 169.6 cents/lb)						
Rubber Companies	260	687.7	687.7	38.8	12.9	...
Multicrop Companies	11	46.5	26.6	39.8	13.5	...
Rubber and Multicrop Companies	271	734.2	714.3	38.9	12.9	...
1957 (RSS 1 Price = 88.7 cents/lb)						
Rubber Companies	196	325.7	325.7	30.9	22.7	7.0
Multicrop Companies	8	34.1	23.1	31.9	17.6	5.1
Rubber and Multicrop Companies	204	359.9	348.8	31.0	22.2	6.8

Sources and Notes: 1) Data compiled, company by company, from Zorn and Leigh-Hunt Manual of Rubber Planting Companies, op.cit., 1953 and 1959.
2) RSS 1 prices from Appendix V - 3.
3) Output unit values used to derive column ii are from Appendix V - 3 for rubber, and from MBS June 1959 and June 1954 for oil palm and copra.

V - 2iii 1906-1939[1]

Table 29 shows the payments series available for the rubber estate industry to the Second World War. In view of the enormous fluctuations in the rubber price, from a high of 315 cents/lb. in 1910 to a low of 8 cents in 1932, wide fluctuations in the proportion of export income retained might also be expected.[2] Moreover, the extreme price variations make comparisons with later years difficult. Also, the output, wages and employment data on which the series are based are less reliable than for later years.

With low outputs and large immature areas often intensively maintained (e.g. by clean weeding) wage bills in the years of the first rubber boom were high, at least while the price was in the $1 to $2 per pound range. Increases in output per acre by 1920 reduced the bill as a proportion of output. For 1923-29 the proportionate wage bill fluctuates inversely with the rubber price. In 1927 with a price of 65 cents (a price in the 1955-68 range) wages are 36% of output, though there are more than four times as many workers per ton of output as in 1966, when the price was 68 cents and wages were 42% of the value of output.[3] Thus the low wages paid during this early period appear largely to have

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[1] This subsection concentrates on the rubber industry in the Federated Malay States only, since data for the FMS are in many cases the only data available. The estate sector's economic structure would differ little between the FMS and the Unfederated Malay States.

[2] In contrast, from 1906-39 the lowest tin price ($60 per pikul in 1931) was equal to as much as 40% of the highest tin price ($151 in 1918 and 1920). See Appendix IV - 4.

[3] 1927 and 1966 figures calculated from Appendices V - 1 and V - 2. Output per man was 0.46 tons in 1927 and 2.06 in 1966.

counterbalanced the more intensive labour use, and wages were not so much more important in total payments relative to more recent times as might have been expected. It can also be seen how the large wages cuts from 1929 to 1932 prevented the wage bill from becoming proportionately large as prices fell. The low proportions of wages after prices rose from 1934 suggest wage rises lagged behind prices.

Table 30 shows profits and dividends for UK rubber companies for 1921 and 1938.[1] It can be seen that even with the low prices of 1920 to 1921 a dividend could be paid as large as those paid today. The large reduction in costs following the great depression is suggested by a comparison of profits and dividends for 1938 with those of 1921, with the same price of rubber. From the wage data available it seems certain that the main cause of lower profits after the Second World War, and, therefore of greater local retention of export earnings, has been rises in wages.

Table 31 shows costs of a number of UK rubber companies, for 1919-22, and is a useful supplement to Table 29. It shows the losses made as prices fell after 1920. Labour costs consist largely of Upkeep and Tapping and Collection, equal to 22.6% of the 1920 output value. These compare to the Table 29 figure which is 15.3% for labour alone.[2] It can be seen that labour is about half of total (estate) costs.

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[1] No earlier years than 1921 are now available, although the manuals from which the data are taken were published from the first years of the century. Even the British Museum does not have copies covering the 1910-20 period. Manuals published before 1910 did not have data in a usable form.

[2] The 19.9% in the Table 29 includes a proration of the original 15.3% wage bill by a correction factor of 1.3 to allow for salaries. See Appendix V - 6.

[illegible]

[illegible]

[illegible] normal equipment [illegible]

[illegible] Labour costs [illegible]

[illegible] for Labour allowed [illegible]

[illegible]

TABLE V - 29 RUBBER ESTATE SECTOR, FMS, CURRENT PAYMENTS STRUCTURE 1906-39

Current Payments as Percentages of Annual Value of Output

	(i) VALUE OF ESTATE OUTPUT ($MIL)	(ii) OUTPUT UNIT VALUE (CENTS/LB)	(iii) TOTAL WAGE BILL	(iv) LABOUR BENEFITS	(v) EXPORT DUTY	(vi) TRANSPORT COSTS	(vii) 100 - (iii to vi)
1906	1.6	180.3	...	...	2.3	...	...
07	3.8	191.5	...	...	2.5	...	...
08	4.6	145.1	...	...	2.5	...	...
09	14.6	239.2	...	...	2.5	...	...
1910	39.8	315.6	27.1	...	2.5	...	70.3
11	44.2	202.8	54.8	9.0	2.5	...	34.2
12	57.3	180.2	53.8	8.4	2.5	...	35.3
13	48.3	106.7	57.7	9.0	2.5	...	30.8
14	46.4	79.3	...	...	2.4	...	...
15	60.8	73.6	36.7	5.8	2.6	...	54.9
16	...	105.0	...	...	...	...	...
17	...	105.7	...	...	...	...	...
18	...	66.3	...	...	...	...	...
19	...	79.3	...	...	...	...	...
1920	189.7	78.7	19.9	3.0	2.5	0.5	74.1
21	...	31.9	...	...	...	...	...
22	...	25.9	...	...	...	...	...
23	75.0	50.2	32.2	5.1	4.1	0.8	57.8
24	56.6	46.7	40.7	6.8	4.3	1.0	47.2
25	151.1	103.5	23.4	3.2	3.1	0.4	69.9
26	209.5	83.1	26.7	3.0	3.7	0.4	66.2
27	133.5	64.6	36.5	4.7	4.6	0.4	53.8
28	75.3	33.5	64.9	7.9	2.8	0.9	23.5
29	110.7	34.2	56.6	6.9	2.1	0.8	33.6
1930	60.8	19.3	37.4	6.7	1.0	1.4	53.5
31	35.6	11.3	49.4	8.2	0.9	2.0	39.5
32	24.7	7.9	42.9	6.9	0.9	2.3	47.0
33	31.2	10.1	51.3	7.2	1.0	1.8	38.6
34	84.8	25.7	26.3	3.8	1.5	0.5	67.9
35	61.2	20.5	33.5	5.5	2.5	0.9	57.6
36	74.0	26.5	30.8	5.0	2.6	0.7	60.9
37	121.2	32.5	29.5	4.8	2.6	0.5	62.6
38	69.5	23.9	38.6	6.6	1.7	0.7	52.4
39	...	31.0	...	...	...	0.6	...

Sources and Notes: 1) Column i is obtained from output figures in Appendix V - 1 multiplied by output unit values (column ii).

2) Columns iii and iv, and vi calculated from Appendices V - 6 and V - 7 respectively.

3) Column v calculated from export duty figures in AR, Federal Secretary, FMS, 1938.

As was the case for 1946-63, the data are not comprehensive enough to allow a proper calculation of the proportion of export earnings retained. It is particularly unfortunate that wages data are not available for the 1916-19 period of high prices and large expansion of output. The 1920 figure shows a large surplus of profit, but Figart's figures in Table 31, which fully specify the inputs, shows gross profits of only about 30%, which is no more than the present day companies of Table 20 earn. What seems likely is that labour use was so intensive that really large profits were not earned except in the early boom years. The period where profits appear strikingly high in relation to the present day is in the post depression years of the 1930's, after the reduction in costs during the depression.[1] As Table 30 shows, profits in 1937 with a price of 32 cents were larger than during the Korean boom in 1950-51 (Table 28) with a price of well over 100 cents. Moreover, no local tax was levied on these company profits in the period before the Second World War.

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[1] See Subsection 1v.

TABLE V - 30

PROFITS AND DIVIDENDS OF UK-INCORPORATED PUBLIC RUBBER PLANTING COMPANIES IN MALAYA, 1921 AND 1937

	NUMBER OF COMPANIES	ANNUAL VALUE OF OUTPUT ($MIL)	ANNUAL VALUE OF RUBBER OUTPUT ($MIL)	PRE-TAX PROFITS AS % OF ii	DIVIDEND AS % OF ii
1921 (RSS 1 Price = 31.9 cents/lb)					
Rubber Companies	217	31.5	31.5	9.6	11.9
Multicrop Companies	16	4.2	2.7	28.2	21.7
Rubber and Multicrop Companies	233	35.7	34.2	11.8	13.0
1937 (RSS 1 Price = 32.1 cents/lb)					
Rubber Companies	276	102.8	102.8	43.8	30.6
Multicrop Companies	14	8.5	6.4	49.5	34.6
Rubber and Multicrop Companies	290	11.3	109.2	44.2	30.9

Sources and Notes: 1) 1921 figures compiled, company by company, from Mincing Lane Tea and Rubber Share Brokers Association, Limited, Rubber Producing Companies 1924 Official Guide for Investors in Rubber Shares (London, 1925). 1937 figures from Zorn and Leigh-Hunt, Manual of Rubber Planting Companies, op.cit., 1938.
2) 1921 profits figures are unreliable. Profits are given on different bases for different companies in the Guide, and insufficient means is given to reduce these figures to a common basis.
3) RSS 1 prices from Appendix V - 3.

TABLE V - 31

MEAN COSTS OF TWENTY-SEVEN MALAYA STERLING RUBBER COMPANIES 1919-22 : FIGART DATA

	CENTS PER LB.				ITEMS AS PERCENTAGE OF OUTPUT UNIT VALUE			
	1919	1920	1921	1922	1919	1920	1921	1922
Upkeep of producing area	6.1	6.3	4.7	3.2	7.7)	8.0)	14.7)	12.4)
Tapping and collection	11.5	11.5	8.4	5.4	14.5) 22.2	14.6) 22.6	26.3) 31.0	20.8) 33.2
Manufacturing, packing, and f.o.b. charges	5.8	6.6	5.9	4.5	7.3	8.4	18.5	17.4
General charges	10.7	13.8	13.7	9.6	13.5	17.5	42.9	37.1
Total Estate Expenditure	36.1	38.7	34.8	23.6	45.5	49.2	109.1	91.1
Depreciation on buildings and machinery	3.0	2.6	3.4	3.2	3.8	3.3	10.7	12.4
Commission to staff	0.8	0.8	0.4	0.3	1.0	1.0	1.3	1.2
Freight and insurance to London	7.1	6.6	4.4	3.4	9.0	8.4	13.8	13.1
London administration charges	1.9	2.1	2.7	2.4	2.4	2.7	8.5	9.3
Total Costs	48.6	50.2	43.8	32.2	61.3	63.8	137.3	124.3
Output Unit Values	79.3	78.7	31.9	25.9	100.0	100.0	100.0	100.0
Gross Profit	30.7	28.5	-11.9	-6.3	38.7	36.2	-37.3	-24.3
Export Duty	1.8	2.0	0.3	0.3	2.3	2.5	0.9	1.2
Corporation and Income Taxes	9.5	8.1	7.9	7.5	12.0	10.3	24.8	29.0
Net Profit	19.4	18.4	-20.1	-14.1	24.5	23.4	-63.0	-54.4

Sources and Notes: 1) All figures except output unit values are from or calculated from D.M. Figart, op.cit., p.65. Figart's original figures (revised in the Table) included taxes and duty as costs.
2) For output unit values see Appendices V - 3 and V - 4.
3) Gross Profit = Output Unit Value - Total Costs; Net Profit = Gross Profit - (Export Duty, Corporation and Income Taxes).
4) Corporation and Income Taxes are a foreign payment, since no local tax was imposed.

Section V - 3 Linkage Effects of Rubber

This section examines the linkage effects of the rubber estate sector through its intermediate purchases of inputs.[1] The methods used are as set out in Chapter III. Linkage effects as a result of capital purchases are dealt with in Chapter VIII.

V - 3i Backward Linkages

The rubber industry makes few intermediate purchases of inputs. Table 32 shows the position for estates and smallholdings combined. Primary factors accounted for over 90% of current purchases. Allocated intermediate purchases account for 3.2% and unallocated items for a further 1.2%.

TABLE V - 32 INTERINDUSTRY PURCHASES OF THE RUBBER INDUSTRY, WEST MALAYSIA, 1965

	($MIL)	PERCENTAGE OF ANNUAL VALUE OF OUTPUT
Chemical Products	6.5	0.6
Products of Petroleum and Coal	0.4	0.04
Wholesale and Retail Trade	8.3	0.8
Imports		
Chemical Products	18.7	1.7
Products of Petroleum and Coal	0.3	0.03
Metal Products and Machinery	0.7	0.06
Unspecified	13.5	1.2
Primary Factors		
Salaries and Wages	482.0	42.2) 91.9
Entrepreneurial Income	520.1	47.7)
Indirect Taxes	39.4	3.6
Subsidies	-	-
Total	1089.9	100

Sources and Notes: 1) From WM, Interinudstry Accounts 1965.

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[1] In principle this section should deal only with estate sector intermediate purchases and sales following the current payments analysis of Section 2. In fact much of the available information is for the industry as a whole. Input purchases and sales do not differ qualitatively between the estates and smallholding sectors, although inputs per unit of output may differ.

Chemical Products are the largest input, the bulk of which was imported in 1965. Products of Petroleum and Coal (i.e. petroleum, since there was no coal production in 1965 or subsequently) purchased for use by vehicles and factory machinery, total less than $1 million. This is an insignificant proportion of local production representing ½% of 1965 output.[1] Wholesale and retail trade purchases will include the value of dealers' contributions to the value of rubber output. Dealers were discussed in Subsection li. The value of their services may be as much as $85 million, which is equal to nearly 8% of 1968 exports.[2] Purchases of metal products and machinery are discussed in Chapter VIII and their importance in current purchases is in any case very small. Local purchases of tapping equipment, not shown in the input-output table, are discussed (briefly) in Chapter VIII.

Chemical Products consist of acid for coagulation (usually formic acid), chemical fertilizer, weedkillers and other items such as anticoagulants. According to Table 32 $25.2 million were spent by the rubber industry on chemical products. According to <u>Rubber Statistical Handbook</u> figures, from Table 18 the rubber estate sector alone spent over $26 million on fertilizers, suggesting that the input-output table

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[1] For local output of petroleum products see Table IV - 34.

[2] The value of dealers' services is calculated as follows: according to Barlow's "Marketing of Smallholders' Rubber", <u>op.cit</u>., p. 3., average dealer margins are 2.1 cents/lb. on smallholder smoked sheet and 8.4 cents/lb. on smallholder unsmoked sheet. Three quarters of smallholders' output is sold as unsmoked sheet (p. 2). With a total 1968 smallholder output of 471,666 tons (<u>RSH</u> 1968), total margins are $71 million. Assuming a smaller margin of, say, one cent per pound on estate output (563,041 tons in 1968) gives a total margin for both sectors of $83 million, say $85 million.

information on fertilizer purchases is incomplete (i.e. the unspecified item includes additional chemicals purchases) The 1968 rubber estate purchases of fertilizers ($14.4 million)[1] was equal to 35% of the output of Industry 4113, Chemical Fertilizer Manufacturing.[2] The reason for the fall in rubber industry purchases is partly a decline in the proportion of acreage immature and partly the switch of estates to oil palm.[3] In 1968 thirteen establishments in West Malaysia produced chemical fertilizers with a workforce of 587 and a non-wage value added per full time worker of $13,849 (very high by Malaysian standards)[4] indicating high capital intensity. Wages per full time worker, $357 per month, are also high by Malaysian standards.[5] Further information on local production of fertilizers and other chemicals was obtained through a series of interviews in Malaysia in November and December 1970, and from the Malaysia Industrial Digest produced quarterly by the Federal Industrial Development Authority.

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[1] RSH, 1968.

[2] CManI, 1968.

[3] The oil palm industry bought $12.8 million of fertilizers in 1968. See OPCTS, 1968.

[4] The non-wage value added per full time worker for all industries covered in the CManI for 1968 is $5024, and $9493 for Pioneer establishments.

[5] The average for all covered industries is $184, and $232 for Pioneer establishments.

The largest producer of the chemical fertilizers in Malaysia and the only producer of compounds[1] is the Chemical Company of Malaysia Sdn Bhd, a subsidiary of the British firm Imperial Chemical Industries Limited.[2] CCM's capacity is equivalent to about two-thirds of Malaysian market demand for fertilizers. The company was formed in 1963, with chlorine and fertilizer plants starting production at Batu Tiga in 1965 and 1967, respectively with Pioneer status. 51% of the capital is held by ICI and 49% by the Malaysian public.[3] The establishment of CCM represents a pattern repeated in the establishment of production of most other agricultural chemicals in Malaysia. A foreign multinational corporation sets up a subsidiary in Malaysia with the tax concession of Pioneer status. Import duties are imposed,[4] and in CMM's case it seems unlikely that the company would be profitable without tariff protection, in view of the small market size. All CCM's straights are imported, except for ammonium nitrate (for conversion into nitrogen) hence the import duty on nitrogenous straights referred to already. Ammonia, for ultimate conversion into ammonium nitrate is bought from the Esso

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[1] Fertilizers can be divided into three. First single nutrient fertilizers, or straights. Straights can be combined into mixtures and compounds. A mixture consists of a straights mixed together physically, usually as a powder. Mixtures are liable to separate during transit. In a compound the various straights are bonded together by a chemical process, often into a concentrated liquid, and separation cannot occur. Rubber requires mainly compounds and oil palm mainly straights. Oil palm use of fertilizer per mature acre is four times that of rubber.

[2] Interview with CCM, November 1970.

[3] Of the 1966 issued capital of $30 million over 90% is for the fertilizer plant. MID, 3, 1970, p. 4.

[4] There is a duty of $60 a ton on all mixtures and compounds, and $50 a ton on straight nitrogenous fertilizers except urea (which is used by padi planters). Most fertilizer prices are in the range of $200 to $300 a ton, thus tax duty is equivalent to about 25% ad valorem.

petroleum refinery at Port Dickson, where it is a by-product. The company employs over 400 people, although most of them work in the godown (warehouse).

Weedkillers are made by a number of recently established firms, mostly subsidiaries of multinational corporations. Ansul Malaysia Sdn Bhd opened its $3 million plant at Batu Tiga near Klang in April 1970, planning to produce arsenite weedkillers to meet total Malaysian demand. Ansul's staff is 40, and it is a subsidiary of the American Ansul company.[1] Similarly, Pacific Chemicals Bhd, a subsidiary of the Dow Chemical Company of the USA, was set up in 1969 to start production in 1970 with a $7 million plant making multiple herbicides, also at the Batu Tiga industrial estate.[2] Again, the Canadian firm of Chemetics started production of weedkillers in 1971 with a $4.3 million factory in a joint venture with the local firm of Mega Chemicals Bhd.[3] Monsanto Chemical Sdn Bhd, another American subsidiary has also started weedkiller production. All apparently have Pioneer status, and tariff protection. Some exporting to nearby countries also occurs.

Formic acid had been made locally by the private company, Malaysian Acid Works, for several years, and supplies most Malaysian demand. Formic acid imports are subject to a 25% duty,[4] presumably to

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[1] MID, 2, 1969, p. 1.

[2] MID, 2, 1969, p. 8.

[3] MID, 3, 1970, p. 11.

[4] Malaysian Trade Classification and Customs Tariff, 1969, 9.95.

TABLE V - 33

WEST MALAYSIAN IMPORTS, PRODUCTION, AND RUBBER INDUSTRY CONSUMPTION OF COAGULATING ACID, 1968

	(i) RUBBER OUTPUT ('000 TONS)	(ii) USE OF COAGULATING ACID (CENTS/LB)	(iii) TOTAL USE OF COAGULATING ACID ($MIL)	(iv) IMPORTS OF FORMIC AND ACETIC ACID($MIL)	(v) LOCAL PRODUCTION OF INDUSTRIAL CHEMICALS ($MIL)	(vi) NET EXPORTS OF FORMIC AND ACETIC ACID($MIL)	(vii) $\frac{iii}{iv + v - vi}$
Estates	563.0	0.3	2.5	...	...	...	...
Smallholding	471.7	0.5	3.4	...	...	...	...
Total	1034.7	0.4	5.9	1.3	8.8	0.05	58.7%

Sources and Notes: 1) Column i from RSH 1968; column ii from Rubber Research Institute of Malaya, Estates Management Handbook 1968, op.cit., p. 66 (assumes smallholdings acid use is equivalent to that of the smallest estates).
2) Column iv and vi from ASET 1968. Formic acid is code 512-501, and acetic acid is code 512-502. Over 80% of the imports of column iv were of formic acid.
3) Column v refers to Industry 4112, Manufacture of Industrial Chemicals (of which coagulating acid is one), from CManI 1968. Unfortunately no breakdown is given of the sales by product of 4112. No other industry is cited as producing coagulating acid.
4) To calculate column iii from columns i and ii it has been assumed that 65% of output of rubber by both sectors is produced as sheet and SMR grades which require acid for coagulation. This is the overall figure derived from RSH 1968.

encourage local production. Table 33 sets out local consumption of acid in relation to the Industry 4112, Manufacture of Industrial Chemicals.

Thus the production of chemicals for the rubber industry (and for other crops) is essentially an exercise in import substitution, using highly capital intensive methods,[1] and with a high indirect import content.

V - 3ii Forward Linkages

Forward linkages from rubber are of two sorts: the off-estate processing sector, and the manufacture of rubber goods.

The offestate processing sector is essentially a 'satellite' industry, in Hirschman's terminology.[2] It is an industry of average to low capital intensity.[3] Total full time employment in 1968 was 9584, most of which was in rubber remilling and latex processing. Less than 1000 workers were employed full time in commercial smokehouses.[4] Total value added was nearly $68 million.

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1. Witness the exceptionally high non-wage value added per worker already referred to.

2 The Strategy of Economic Development, op.cit., pp. 102-4.

3 Non-wage value added per full time worker was $5,423 in Rubber Remilling and Latex Processing Off-estates in 1968, and $3501 in Rubber Smokehouses Off-Estates. See CManI, 1968.

4 CManI, 1968.

The local manufacture of rubber goods dates from before the Second World War.[1] A wide range of products is made, including long established items such as rubber shoes and items newly produced locally such as tyres. The main industries in the rubber products Group are 4010, Manufacture of Rubber Footwear; 4021, Manufacture of Tyres and Tubes; 4030, Foam Rubber products; and 4090, Manufacture of Rubber Products. Combined statistics only are given for these industries in the Census of Manufacturing.

In 1968 there were 45 establishments with 7673 full time workers, and total value added was $46.6 million. Non-wage value added per head was $3911, a low figure by Malaysian standards. The industry included four public companies, of which the tyre manufacturer Dunlop Malaysia would have been one, with very much higher capital industry of $11,438. This shows a new type of production being introduced into the industry with Pioneer status and tariff protection. About a quarter of the industry's employment was in these large firms. To keep the industry in perspective, however, it must be noted that total local consumption of natural rubber by Malaysian manufacturers in 1968 represented only 1.7% of West Malaysia's rubber output.[2]

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[1] According to the British Malaya Census of 1931, 100 people were employed in the Federated Malay States in the manufacture of rubber goods.

[2] RSH, 1968.

V - 3iii The Estate Sector and the Participation of Smallholders in the Rubber Industry[1]

In many respects the early growth of the rubber industry in Malaya represented the grafting of an alien economic sector onto the domestic economy. Not only was most of the capital and management for the estate sector imported, but also most of the labour.

It has been shown in the present section that rubber has generated few interindustry purchases. Wage payments, predominantly to Indian labour, although they can now be regarded as a local expenditure,[2] were in the early days of the industry payments to an essentially transient community. The permanent population (i.e. the Malays) participated in the industry directly, by planting rubber themselves.

It is interesting therefore to ask to what extent the estate sector was responsible for the development of the Malay smallholding sector. Unfortunately little information is available. It is clear that expansion of smallholdings lagged behind that of estates. The boom in estate expansion in the early 1910's was not matched by smallholdings until the late 1910's. The development of tapping methods depended more on government action than on estates. Few Malays were employed by estates so that tapping and cultivation methods cannot have

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[1] The information on which this subsection is based has been set out already in Subsection 1iv. The present subsection attempts to draw some general conclusions on a particularly important issue arising from that information.

[2] The question of when the Indian and Chinese communities, originally immigrants, should be regarded as permanently resident in Malaysia is discussed in Chapter III.

been learnt by Malays on any large scale from estate work. Little is known about the initial spread of the simple processing methods used by smallholders, which were in contrast to the estate method of using heavy creping machinery. It seems likely that the estate sector's influence was limited to showing the economic potential of rubber, and helping to establish a network of dealers (mostly Chinese) who would buy at the kampong level. Estates seem to have had little influence on the direct transfer of rubber growing and processing technology to smallholdings.

Section V - 4 Rubber Estate Capital Costs

Following the procedure used in Chapter IV, and following the methodology described in Chapter III, this section sets out rubber capital requirements, concentrating on the relative sizes of local and foreign payments. Subsection 4i gives capital costs for field establishment, and 4ii gives factory capital costs. The effects of local expenditure generated by factory construction are analysed in Chapter VIII (on the Malaysian engineering industry). The relative importance of factory and field cost expenditure is shown in Section 4iii.

V - 4i Field Establishment Costs

Table 34 sets out, with references, the available information on estate new planting costs, based mainly on work by Ng Choong Sooi of the Rubber Research Institute of Malaya. Replanting costs are very similar both in total and in composition to new planting costs. Since a breakdown into labour and non-labour costs (albeit a limited one) is available only for replanting expenditure, the latter has been included in the Table. Even the small number of labour costs specified sum to nearly half of replanting expenditure. The main materials items are fertilisers and weeding chemicals ($185.7), which are about 20% of total expenditure. If a further 10% points of materials expenditure is assumed, at least two thirds of direct field costs would be on labour, a local expenditure. Since many weedicides and fertilizers are now produced locally, as described in Subsection 3i, almost all direct field costs represent local expenditure. Total direct field costs are some

TABLE V - 34 RUBBER ESTATE REPLANTING COSTS, 1956-1963: NG CHOONG SOOI DATA

COST ITEMS	(i) REPLANTING TOTAL DIRECT FIELD COST ($ PER ACRE)	(ii) ITEMS IN i AS % OF TOTAL COST PER ACRE IN i	(iii) REPLANTING LABOUR COST ($ PER ACRE)	(iv) TOTAL DIRECT NEW PLANTING FIELD COST ($ PER ACRE)	(v) ITEMS IN iv AS % OF TOTAL COST PER ACRE IN iv
Weeding of Rubber & Cover	365.9	40.9	305.2	397.8	47.5
Manuring of Rubber	152.3	17.0	27.3	123.9	14.8
Cover Establishment and Maintenance	55.7	6.2	...	30.2	3.6
Felling and Clearing	41.9	4.7	...	51.3	6.1
Pest and Diesease Control	38.8	4.3	...	4.5	0.5
Supplying, Pruning, and Windfall	36.7	4.1	...	41.3	4.9
Terraces	34.6	3.9	32.1	28.2	3.4
Planting and Budding	33.2	3.7	...	14.1	1.7
Holing, Lining and Filling	27.8	3.1	...	14.4	1.7
Drainage and Soil Conservation	26.0	2.9	26.0	28.0	3.3
Survey, Transport, etc.	22.6	2.5	...	39.1	4.7
Pre-felling Weeding	21.3	2.4	...	38.1	4.6
Roads and Bridges	16.4	1.8	12.2	18.7	2.2
Fences and Boundaries	11.8	1.3	...	5.6	0.7
Nursery	9.8	1.1	6.8	2.1	0.3
TOTAL	894.8	100.0	409.6 Minimum (45.8% of Total Cost)	837.3	100.0

Sources and Notes: 1) Columns i and iii from Ng Choong Sooi, "Economic Aspects of Replanting on Rubber Estates" (University of Malaya M.Sc. (Agric.) thesis, Kuala Lumpur, 1969), pp. 54-83.
2) Column iv from Ng Choong Sooi, "Some Aspects of Estate Replanting and New Planting Costs," (RRIM Planters Conference paper, 1967, preprint), p. 4.
3) Ng's data were collected from estates of over 500 acres, mainly in Selangor.
4) The immature period of replanted rubber is taken as seven years, and six years for new planted rubber. Hence the lower total cost of the latter.
5) Costs occur over the whole immature period, but are given here in undiscounted form.
6) Costs exclude general charges, labour benefits, depreciation on vehicles, buildings and equipment. These are estimated as a total of $300 per acre for 'unseen emoluments' and $245 per acre for "administration and supervision" (for replanting) by C. Barlow and Ng Choong Sooi, "Budgeting on the Merits of a Shorter Immature Period", Planters' Bulletin, November, 1966, p. 217. Thus total cost per acre is $1440.

60% of total costs.[1] A further 20% are unseen emoluments, which include workers' housing, medical benefits, etc. Again mainly local expenditure. Administration and supervision charges (20% of total costs) would include foreign payments in the form of expatriate salaries and overseas head office expenses, but many local expenditures too. Thus it seems unlikely that less than three quarters of capital expenditure on field establishment represents local payments.

Initial cleaning and sometimes planting is normally carried out by contractors, while maintenance of the immature area is done by the estates' own labour force.

V - 4ii <u>Rubber Factory Capital Costs</u>

Detailed breakdowns of capital costs were collected for three factories producing Standard Malaysian Rubber (SMR) and one Ribbed Smoke Sheet (RSS) factory. These are presented in Tables 35 to 38, respectively.

Local content is high. For SMR factory A, the only major item where local content is not predominent is the diesel generating set. Imported content in virtually all other cases represents small components imported. For factory B local content is lower since it imports an unusually high proportion of its machinery. Moreover, when the indirect import component of building is taken into account the local proportion falls to a minimum of 20%, although possibly as high as 40%.[2] For

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[1] See Table 34 note 6.

[2] If maximum local content is combined with a minimum estimated proportion of structural steel in building costs.

TABLE V - 35

ITEMIZED CAPITAL COSTS : SMR FACTORY A

(Capacity 10 tons/day DRC)

COST ITEMS		COST ($000)	% LOCAL CONTENT
1.	Bulking tanks	2.9	100.0
2.	Coagulating tanks	9.4	100.0
3.	Size reduction equipment	89.6	79.0
4.	Conveyors	8.1	49.4
5.	Crumb tank	2.9	100.0
6.	Drier	55.0	90.4
7.	Press	18.0	81.7
8.	Blending tank	3.6	100.0
9.	Pumps	7.2	-
10.	Weigher	1.9	-
11.	Buildings (wooden construction)	77.6	100.0
12.	Switchboard	4.1	26.8
13.	Electrical installations	12.3	34.1
14.	Diesel generating sets	99.1	9.2
15.	Power house	5.3	100.0
16.	Internal water supply	3.0	100.0
17.	Preliminaries (excluding site clearing)	10.0	100.0
TOTAL		410.0	64.1%

Sources and Notes: 1) Information from interview in Malaysia, October 1970.
2) Factory not designed for further expansion.

TABLE V - 36

ITEMIZED CAPITAL COSTS : SMR FACTORY B

(Capacity 8 tons/day DRC)

COST ITEMS		COST ($000)	% LOCAL COMPONENT
1.	Site preparation	11.1	100.0
2.	Main drains	8.6	100.0
3.	Factory compound and approach roads	16.4	100.0
4.	Factory buildings, including office, store & workshops	199.1	100.0
5.	Machinery and equipment	268.7	28.9
6.	Water supply	54.2	...
7.	Electrical installation	34.8	...
8.	Weighbridge and house	26.0	10.0*
9.	Fire fighting appliances	1.2	-
10.	Equipment for office, store, and workshop	2.6	100.0
TOTAL		622.7	51.4%(Minimum) to 65.4%(Maximum)

Sources and Notes: 1) Information from interview in Malaysia, October 1970.
2) Factory not designed for further expansion.
3) Local content of item 8 is estimated. The weighbridge is imported, and the house is local.
4) Imported structural steel in item 4 will account for 50% - 75% of cost of buildings (based on oil palm and dredge building data). This reduces local content by between 21.6% and 32.4% points.

TABLE V - 37

CAPITAL COSTS : SMR FACTORY C

	COST ($000)	% LOCAL CONTENT
Stage 1 (10 tons/day)		
Machinery	313.6	49.9
Civil Works	425.1	100.0
TOTAL	738.6	78.8
Stage 2 (30 tons/day)		
Machinery	333.9	47.0
Civil Works	35.5	100.0
TOTAL	369.4	52.1
Total Both Stages		
Machinery	647.5	48.4
Civil Works	460.6	100.0
TOTAL	1108.0	69.8

Sources and Notes: 1) Information from interview in Malaysia, October 1970.
2) Civil works includes imported structural steel (see Table 36 note 4).

TABLE V - 38

ITEMIZED CAPITAL COSTS : RSS FACTORY

(Capacity : 2000 lbs/day DRC)

		COST ($000)	% LOCAL CONTENT
1.	Factory Building and Packing Shed	18.5	100.0
2.	Sheeting Battery	9.5	89.5
3.	Coagulating Tanks (aluminium) (7 @ $1800)	12.6	100.0
4.	RRIM 2200 Smokehouse (including trucks, rails, and turntables)	16.0	100.9
5.	Baling Press (with motor)	5.5	100.0
TOTAL		62.1	97.6%

Sources and Notes: 1) Costs from Rubber Research Institute of Malaya "RSS Factory Layout for 2,000 lbs per day Maximum Crop", (undated), unpublished paper, supplied by RRIM December 1969. To item 2, the sheeting battery, has been added an estimate for an engine ($1,500). Engine cost from Planters Bulletin "Budgeting for Small Estate Factories", (no author given), November 1967, p. 295.
2) Items 3 (coagulating tanks) and 5 (baling press), embody a substantial indirect import content. Aluminium for the tanks, although rolled locally is imported in ingot form. The hydraulics (at least) of the baling press will be imported. Certain parts of the sheeting battery, e.g. bearings, are also imported. It is assumed that the buildings are wooden, with little import content. It is highly unlikely, however, that local content overall could be reduced to below 70%.

factory C, also although local content apparently is high, it could be reduced to below 60%.[1]

Since the value of machinery in an SMR factory is low relative to, say, an oil palm factory, the percentage import content represented by imported steel is higher, over 20% in a 10 ton/day factory. Local content can be increased by using wooden structures, which also reduces total capital costs. It is clear from factory A, that if local manufacturing capacity is used, almost a complete factory can be produced locally except for prime movers and a few specialized items.

The capital cost data for an RSS factory, in Table 38, show exceptionally high local content. This is due to the predominance of construction items and simple equipment.

V - 4iii The Relative Importance of Factory and Field Establishment Costs in Rubber Capital Expenditure

Table 39 estimates the relative importance of factory and field capital costs in rubber estates cultivation. The factory is seen to be of minor importance in total costs.[2] It is likely that the importance of factory costs is overstated at the 10 tons/day level since several factories included in the calculation were designed for future expansion.

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[1] This implies that Civil Works include about $125,000 indirectly imported items, mainly steel and electrical equipment.

[2] In contrast, for example, to oil palm. See Appendix VIII - 2.

TABLE V - 39 FACTORY AND FIELD ESTABLISHMENT COSTS FOR RUBBER

	FACTORY CAPACITY (DRC PER DAY)		
	10 TONS	20 TONS	40 TONS
Mean Factory Capital Costs	$685,000	$685,000	$1.56m.
Acreage Served by Factory	2,700	5,400	10,800
Total Field Establishment Cost of Acreage Served by Factory (at $1385 per acre)	$3.74m.	$7.45m.	$14.96m.
Total Capital Cost	$4.42m.	$8.31m.	$16.52m.
Factory Cost as % of Total Cost	15.5%	10.4%	9.5%

Sources and Notes: 1) Mean factory capital costs are calculated on a per ton basis from the three SMR factories in Tables 35 to 37, together with six other factories, whose costs are as follows

1. $739,000 for 10 tons, rising to $1.1 mil. for 30 tons.
2. $1.0 mil. for 10 tons, rising to $2.2 mil. for 40 tons.
3. $878,000 for 10 tons, rising to $1.5 mil. to $1.8 mil. for 20 tons, and $2.3 mil. for 40 tons.
4. $598,000 for 20 tons, rising to $1.0 for 40 tons and $1.4 mil. for 60 tons.
5. $436,000 for 12 tons, rising to $725,000 for 24 tons, $1 mil. for 36 tons and $1.3 mil. for 48 tons.
6. $551,000 for 22 tons.

Costs of factories 1 to 4 are from interviews in Malaysia, October to December 1970. Factory 5 is from FLDA, Jengka Triangle Report, (1967), Volume II, Resources and Development Planning 192. Factory 6 is from J.W.L. Bevan and T.J. Goering, "The Oil Palm in Malaysia, An Estimate of Product Prices and Returns to Investment", op.cit., p. 164. Bevan and Goering give an investment appraisal of rubber to provide a comparison with oil palm.
2) Field establishment costs per acre are from Table 34. They assume non-direct costs to be $545 per acre (note 6) and new planting costs to be a rounded figure of $840.
3) The acreages served by factory is calculated on the Jengka Triangle(op.cit p.192) assumptions of peak year crop of 1645 lbs. per acre. Assuming 300 tapping days per year and that one eighth of crop occurs in peak month, the peak month capacity required in the peak year will be approximately 3.7 tons per day for 1000 acres. This is also similar to the figure implied in the Bevan-Goering calculation (op.cit, p. 164) which assumes that a 50,000 lbs/day factory is needed for an estate of 6000 acres with maximum yield of 1800 lbs. in peak year.
4) Costs are undiscounted.

If it is assumed (conservatively) that 75% of field establishment costs and 60% of factory costs represent local expenditure and that factory costs are 10% of total capital costs, then the overall local content of rubber capital expenditure is 73%, say 70%.

CHAPTER VI

TECHNOLOGY AND TECHNOLOGICAL EXTERNALITIES

In the theoretical literature discussed in Chapter II it was suggested that export growth not only provided opportunities for capital formation, but also generated improvements in factor quality and other technological externalities. The principal improvement in factor quality was the development of labour skills. The introduction of new technology into the domestic economy was also stressed. Both were seen as prerequisites for rises in income per head.[1] Section 1 presents a comparative discussion of labour skills in tin dredging, gravel pump tin mining, and rubber estates. Oil palm estate skills are also set out for comparison with rubber. Section 2 discusses the diffusion of new technology both in principle and in the case of Malaysia.

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[1] The position is most clearly stated by Robert Baldwin in "Export Technology and Development from a Subsistence Level", op.cit., especially p. 80, and pp. 90-92. Baldwin's approach lays particular stress on the role of technological externalities. As was stated in Section II - 3, Baldwin's work is as nearly a definitive account of the trade-growth mechanism as exists at present.

Section VI - 1 Labour Skills

An initial comparison between the skill structures of rubber and oil palm[1] and tin mining is given in Table 1. Table 2 splits the tin industry into its two main sectors, giving details of skilled workers and their wage rates. Table 3 provides more details of the oil palm and rubber workforces together with wage rates. Tables 4 and 5 provide data to split the "factory worker" category in previous tables into its skilled and unskilled components for rubber and oil palm. Table 6 summarizes the information of the preceding tables into skilled labour coefficients, by industry.

Skill structure is defined in two ways. First, there are the proportions of each industry's workforce in particular occupational categories. Second, the average earnings within each category provide a comparison of the quality of labour relative to labour in the same category in other industries. Similarly, average earnings in an industry can be compared to those of other industries as an indication of labour quality. Four skill categories are used here: supervisory and management staff (both senior and junior), clerical workers, artisans (both skilled and semi-skilled), and unskilled workers.

The relative importance of supervisory and management staff in rubber, oil palm, and tin is shown in Table 1. Tables 2 and 3 show that both dredging and gravel pumping employ proportionately twice as many (6% of workforce) in the junior supervisory staff category (foremen, kepalas, assistant kepalas and mandores), as do oil palm and rubber (3% of workforce). It is the difference in junior staff which

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1 For conciseness, the terms "rubber" and "oil palm" will refer in this chapter to the estate sectors only, unless otherwise stated.

TABLE VI - 1 MAJOR OCCUPATIONAL CATEGORIES ON RUBBER AND OIL PALM ESTATES, AND TIN MINES, 1968

(% OF TOTAL EMPLOYMENT IN EACH INDUSTRY)	RUBBER	OIL PALM		TIN
Administrative, Managerial, and Supervisory	4.6	5.2		7.4
Clerical	1.0	2.7		4.0
Tappers/Harvesters	70.6	19.6	Skilled Artisans	18.7
Weeders	14.4	43.0	Others	69.8
Factory Workers	5.0	7.4		
Others	4.3	22.2		
Total Employment	206,680	34,490		48,490

Sources and Notes: 1) All figures calculated from HLS, 1968.
2) 'Others' in oil palm will include transporters and pruners. See Table 3.

accounts principally for tin's 7.4% in the supervisory/management category in relation to 4.6% and 5.2% in rubber and oil palm, respectively. Subtracting junior supervisory/management staff from the percentages given in Table 1 gives senior staff percentages of 1.6%, 2.2%, and 1.4% for rubber, oil palm, and tin mining respectively. The higher proportion in oil palm is probably accounted for by the need for more senior factory personnel than in rubber. The higher quality of junior staff in mining is indicated by the fact that in gravel pumping their average earnings are 50% higher, and those in dredging over twice as high, as in rubber or oil palm. Particularly on dredges, supervisors are likely to be skilled artisans who have been promoted. No figures are shown to relate management and other senior supervisory salaries in the four industries. It is likely that estate managers in rubber and oil palm earn similar salaries, while oil palm factory managers and engineers (who are in extremely short supply) earn much more than their counter-

TABLE VI - 2

SKILLED AND SEMI-SKILLED ARTISANS AND JUNIOR SUPERVISORY STAFF ON GRAVEL PUMP MINES AND TIN DREDGES, 1968

GRAVEL PUMP MINES	(i) % OF TOTAL WORK-FORCE	(ii) AVERAGE MONTHLY EARNINGS ($)	DREDGES	(iii) % OF TOTAL WORK-FORCE	(iv) AVERAGE MONTHLY EARNINGS ($)
Kepalas	2	287) 288	Foremen	2	545) 327
Assistant Kepalas	4	199)	Kepalas	4	218)
Clerks	4	176	Skilled Workshop employees	8	281
Engine Drivers - 1st class certificate	3	185(179)	Semi-skilled Workshop employees	2	204
- 2nd class certificate	2	119(147)	Drivers	3	232
Chargemen, with certificate	2	222(200)	Skilled Dredge crew	10	280
Excavator and Bulldozer drivers	2	209(149)	Semi-skilled Dredge crew	5	186
			Lorry drivers	1	198
			Apprentices	1	146
			Clerical workers	4	...
Total of above categories	19	184(for all workers including unskilled)	Total of above categories	40	254(for all workers including unskilled)
Estimated monthly labour benefit per head		47	24		
Total Workforce		35,514	10,720		

Sources and Notes: 1) Wages and breakdown of labour force (except for certain dredging categories) from HLS, 1968. Additional details of dredging labour force breakdown from private communication from West Malaysia Ministry of Labour, March 1970.
2) Average wages calculated from total wages and salary bills in CMinI, 1968. They included salaries of management personnel not listed above. Average wage for 'gravel pump' mines is in fact the average wage for 'other tin' mining which employs 41,407 workers.
3) Workforce figures from Appendix IV - 3.
4) Labour benefits (from Appendix IV - 9) are food ($40) and accommodation ($6) in gravel pump mines, and accommodation ($20) for thedredging workforce. Medical benefits are $1 for gravel pump mines and $4 for dredges (from CMinI, 1968). Food and accommodation values are those for workers actually receiving those benefits, not the average expenditure on free food and accommodation for the whole workforce. For 'other tin mining' average free food per head was $27. This average of $27 is consistent with 80% of the gravel pump workforce receiving free food, while none of the 6,000 workers in non-gravel pump 'other tin' receives free food. No values for accommodation are given in the CMinI.
5) No figure for clerical staff is given for dredging in the HLS. However, since the proportions of clerks in all tin mines (4%) and gravel pump tin (4%) are known, dredging is also assumed to employ 4% of its labour force as clerks.
6) Bracketed wages are those of workers employed on contract.

TABLE VI - 3 WAGES AND STRUCTURE OF LABOUR FORCE ON RUBBER AND OIL PALM ESTATES, 1968

	(i) % OF TOTAL WORK-FORCE	(ii) AVERAGE MONTHLY EARNINGS ($)		(iii) % OF TOTAL WORK-FORCE	(iv) AVERAGE MONTHLY EARNINGS ($)
Mandores/Kepalas	3.0	155		3.0	146
Tappers/Harvesters	70.6	99		19.6	130
Weeders	14.4	66		43.0	69
Arsenite Sprayers	1.0	92		1.0	133
Factory Artisans	...	118		...	188
All Factory Workers	5.0	107		7.4	148
			Transporters	8.0	104
			Pruners	1.0	106
Average Earnings (all workers)		114			117
Estimated Monthly Labour Benefits per Head		14			14

Sources and Notes: 1) Average earnings from HLS 1968. Proportions of workforce also from HLS except Mandores/Kepalas, Sprayers, Transporters and Pruners which are from AR Ministry of Labour, WM, 1965. Proportions of other categories differed between 1965 and 1968, thus the 1965 figures give only rough orders of magnitude for 1968.
2) Average monthly earnings are from RSH 1968 for rubber. For oilpalm, the OPCTS (the publication comparable to the RSH) give no wage bills. Therefore the average wage shown for oil palm is the weighted mean of the wages given in the Table, ($97.82) multiplied by a correction factor of 1.2 (the same as in Rubber - see Appendix V - 6) to take account of salaries of senior personnel.
3) Labour benefits for rubber calculated from RRIM, Guide to Estate Management, 1968, op.cit., p. 30. Oil palm benefits are assumed the same as for rubber since oil palm estates provide similar accommodation and other facilities.

parts in rubber. Thus an oil palm mill engineer with a steam certificate and several years experience would command a salary of over $3500 a month,[1] a salary rarely matched for work in a rubber factory. Dredges employ dredgmasters and shift engineers. The manager of the dredging site is normally a dredgemaster.

Tables 1 and 2 show that the proportion of clerical staff in rubber is rather less than in gravel pump mining and dredging, and slightly less than in oil palm. No obvious explanation suggests itself for the

[1] Interview with an oil palm mill manager in Johore, September 1970. This salary would be for a local person. An expatriate might get more.

TABLE IV - 4 SMR RUBBER FACTORY LABOUR REQUIREMENTS

	10 TONS DRC/DAY	30 TONS DRC/DAY
Process Labour	27	38
Skilled, Clerical, and Supervisory Labour		
Conductors	3	3
Shift Fitters/Electricians	3	3
Drivers	3	3
Skilled Workshop Personnel	5	5
Clerical Staff	5	5
Manager	1	1
Engineer	1	1
Total	48	59
Skilled, Clerical and Supervisory Labour as % of Total	43.7	35.6

Sources and Notes: 1) Information from interview in Malaysia, October 1970.
2) Factory works three shifts per day.
3) RSS factories use much simpler processes than the new process rubber factory whose labour force is shown above. Thus the skill component of an SMR factory would represent a maximum for all rubber factories.

low proportion in rubber, especially relative to oil palm. Gravel pumping's high proportion (and to a lesser extent that of dredging) is probably accounted for by the fact that the industry is organized into relatively small scale units of employment. No wages data are available for clerical staff other than in gravel pumping where clerks are paid at a rate comparable with skilled artisans. On rubber estates particularly, clerks often perform supervisory functions. Thus a factory clerk would supervise the weighing in and recording of latex bought by the tappers, and might earn over $500 a month.[1] Clerks in oil palm factories are similarly well paid.[2]

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[1] One factory visited in December 1969 paid its clerk $630 a month.

[2] An oil palm mill visited in September 1969 paid its clerk $550 a month.

TABLE VI - 5 PALM OIL FACTORY LABOUR REQUIREMENTS

	3-5	10-15	20-25 (TONS FFB/HR)	30	40
Mill					
Skilled					
Senior Mill Engineer	-	1	1	1	1
Mill Engineer	1	1	2	2	2
Trainee Engineer	1	2	2	2	2
Electrical Chargeman	1	1	1	1	1
Boiler House Chargeman	1	2	2	2	2
Production Foreman	1	2	2	2	2
Fitter, Mechanical	2	3	4	5	6
Fitter, Electrical	1	2	2	2	2
Engine Driver, Steam	2	3	3	4	4
Engine Driver, Diesel	1	2	2	2	2
Laboratory Analyst	1	2	2	2	2
Engineers	2	2	3	4	5
Supervisors	2	2	3	4	5
Artisans	4	7	10	13	16
Clerks	2	3	3	4	5
Unskilled					
Labourers	30	45	60	75	90
Workshop					
Skilled					
Chargeman	1	1	2	2	2
Assistant Chargeman	-	1	1	2	2
Welders	1	2	3	3	3
Turners	1	1	2	2	2
Blacksmiths/Carpenters/Masons	2	3	5	5	5
Total Workforce	57	88	115	139	161
Skilled Workers as % of Total Workforce	47.4	48.9	47.8	46.0	44.1

Sources and Notes: 1) All figures from FLDA, Jengka Triangle Report, op.cit., Appendices, op.194.

It is the employment of artisans which accounts for the much higher skilled proportion of the workforce in mining than in estates, as summarized in Table 6. In oil palm and rubber artisans are employed almost entirely in factory (and workshop) work, accounting for just over 3% of workforce in oil palm and under 2% in rubber. In gravel pumping nearly 10% of workforce are artisans, and nearly 30% in dredging. The average wages for artisans (not shown in Tables) are $248 for dredging and $185 for gravel pumping.

TABLE VI - 6 SKILLED LABOUR COEFFICIENTS ON GRAVEL PUMP MINES, TIN DREDGES, AND RUBBER AND OIL PALM ESTATES, 1968

	(i) VALUE OF OUTPUT ($MIL)	(ii) WORKFORCE	(iii) PROPORTION OF WORKFORCE SKILLED	(iv) SKILLED WORKERS PER $MILLION OF OUTPUT	(v) TOTAL WORKERS PER $MILLION OF OUTPUT	(vi) TOTAL WORKERS PER $MILLION OF INVESTMENT	(vii) SKILLED WORKERS PER $MILLION OF INVESTMENT
Gravel Pump Tin	412.446	35,514	0.20	17.2	86.1	234.9	47.0
Tin Dredges	219.557	10,720	0.41	20.0	48.8	19.4	8.0
Rubber	683.577	206,680	0.07	21.2	302.3	78.4	5.5
Oil Palm	138.997	34,490	0.11	27.3	248.1	34.3	3.8

Sources and Notes: 1) Tin outputs and workforces from Appendices IV - 2, IV - 3, and IV - 4. Rubber output and workforce from RSH 1968. Oil Palm output from OPCTS 1968 multiplied by net export unit values for kernels and oil from MBS July 1970, and workforce from HLS 1968.
2) To the proportions of skilled labour in the tin mining sectors in Table 2 have been added 1% to take account of mine managers and other executives.
3) Rubber and Oil Palm skill contents based on Table 1. 35% and 45% of the rubber and oil palm factory workforces, respectively, are assumed to be skilled. Clerical workers are also assumed to be skilled. Tappers, weeders, etc. are assumed unskilled and are not included.
4) Oil palm output may be overstated to the extent that output of FLDA schemes is processed by private factories and is therefore listed as private estate production in OPCTS.
5) Labour coefficients are understated to the extent that they exclude workers engaged in the production of intermediate goods used in the final product. Rubber and oil palm make few inter-industry purchases, both absolutely and relative to tin. Thus the tin mining labour coefficients are understated relatively. The industries supplying tin mining - principally electricity supply and petroleum refining - are ones with very low overall labour coefficients and high skill contents. Thus the skill coefficients will be particularly understated in tin.
6) Column vi coefficients calculated from capital costs from the following sources:
Gravel Pump Tin - Table IV - 40 - a mine in Kinta, Perak, whose capital cost was $149,000, and whose employment (not shown in Table IV - 40) was 35.
Tin Dredges - Table IV - 35 - a dredge whose capital cost was $9.0m., and whose employment (not shown) was 175.
Rubber - Table V - 37 - capital costs of $16.5m. for a factory of 40 tons/day DRC and its associated acreage of 10,800. Table V - 17 shows a coefficient of 0.12 workers per planted acre in 1968.
Oil Palm - Table 1 of Appendix VIII - 2 - capital costs of $26.3m. for a mill of 40 tons FFB/hour capacity and associated acreage of 12,900. OPCTS 1968 statistics allow a labour coefficient to be calculated of 0.07 workers per planted acre.
7) Column vii = column vi x column iii, and column iv = column v x column iii.

In the unskilled category, the quality of the labour force also appears higher on mines than estates. Gravel pump mine unskilled workers earn about $130 a month compared to $150 for unskilled dredge crews and dredge workshop workers.[1] Tappers on estates earn $100, while oil palm harvesters earn $130. Almost no mine workers earn much below $100

[1] HLS, 1968.

(excluding labour benefits).[1] On estates, especially oil palm, there are substantial proportions of much lower paid workers (weeders) who earn only $70.

The overall average wages in both gravel pumping and dredging are slightly higher (when labour benefits are included), than in manufacturing industry as a whole in West Malaysia.[2] Those in estates are substantially lower. Thus the overall quality of the labour force in mining is comparable with manufacturing.

Wage differentials reflecting time spent in the acquisition of skills specific to individual export industries indicate increases in labour quality. Such quality increases are important in themselves since they raise productivity and per capita incomes within the export sector. For the sector to generate <u>externalities</u> to other industries, skills must be transferable. The skills of artisans such as fitters, boilermakers, electricians, etc. are the most obviously transferable. They are usable by almost any manufacturing industry, and elsewhere in the economy. To a certain extent management supervisory and clerical skills are also transferable. Managers of rubber estates can switch to oil palm or other crops. The executive responsibilities and general engineering knowledge of mine engineers could be transferred although their specific mining skills could not. More junior supervisory positions are often given to older men, especially in Chinese mines, who have had long experience in the industry. As such, their

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1 Among the lowest paid are unqualified engine drivers and chargemen on gravel pump mines.

3 According to the 1968 <u>CManI</u>, average monthly wages per full time worker were $184 in all covered industries, and $172 in all non-Pioneer establishments

experience may be difficult to transfer. The same difficulty applies to clerical staff to the extent to which, as is often the case, they exercise some supervisory functions. Tapping skills are of little use outside the rubber industry, although the existence of a labour force already used to estate work is valuable to new estate crops such as oil palm. Of course, familiarity with the rubber industry lends itself to workers setting up as smallholders.[1]

The skilled labour coefficients in Table 6 show that the total quantity of skilled workers generated by each export industry per $million of output is actually higher on estates than on mines. The very low skill content of the estate labour force is more than compensated for by very high overall labour coefficients. Thus in terms of externalities rubber and oil palm are as great providers of skills as are mines. However, in terms of the improvement of the quality (and therefore the real income per head) of their own labour forces, estates lag far behind. The use of a coefficient relating skilled labour to investment, on the other hand, shows a marked superiority for gravel pump mining, because of its low initial capital requirements.

Few data on the skill structure of the Malaysian workforce by industry are available for West Malaysia, other than those published by the Ministry of Labour for a limited number of industries. Table 7 shows a cross-classification of occupational groups by industrial sector from the 1947 Census of Population. Unfortunately no similar cross-classification is given in the 1957 Census, and the 1970 Census data are

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[1] In fact, this process is restricted by institutional constraints. Indians, who are the bulk of the estate labour force, would find difficulties in acquiring new land for rubber.

not yet available. Rubber is not shown separately from other agriculture. The Table does show, however, that for certain occupations, mining (and quarrying) had a high concentration of the skilled workforce. Thus with only 2.5% of total workforce it has 14.7% of all fitters in the Federation and 36% of all stationary engine drivers.

Most skilled occupations in the export industries discussed are performed by local people. Expatriates are confined entirely to the Administrative, Managerial, and Supervisory category of Table 1. No detailed figures are available for European employment, but the total proportion in 1968 of "other races" (i.e. non-Malay/non-Indian/non-Chinese) was 0.2% in rubber, 0.3% in oil palm, and 0.7% in tin.[1] This category includes all Europeans, as well as other non-Malaysian Asians, e.g. Japanese. It is assumed as stated earlier in this section that senior supervisory staff are 1.6% of the workforce in rubber, and 2.2% in oil palm, then it can be seen that much of management is Malaysian. The tin figure (1.4%) conceals the fact that since virtually no Europeans are employed in gravel pump mines the 350 "others" employed in tin will be mostly on dredges. Allowing say 20 Europeans for work in non-dredging, non-gravel pump tin mines such as Pahang Consolidated and Gopeng, this gives a proportion of 3.1% of the dredging workforce, indicating that most of the management is still European.

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1. HLS, 1968.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

TABLE VI - 7

SELECTED SKILLED OCCUPATIONS BY INDUSTRY, 1947 CENSUS OF POPULATION OF MALAYA

(EMPLOYMENT BY INDUSTRIAL GROUP AS % OF TOTAL NUMBER OF WORKERS IN EACH CATEGORY)	(i) MINING AND QUARRYING	(ii) MANUFACTURING BUILDING ETC.	(iii) AGRICULTURE AND FISHING	(iv) TRANSPORT AND COMMUNICATIONS	(v) TOTAL WORKING POPULATION OF FEDERATION OF MALAYA
Fitters, etc.	14.7(5.9)	52.5(6.6)	3.9(0.1)	6.1(1.9)	100.0
Motor Mechanics	0.9(0.4)	71.9(9.0)	0.4(-)	14.0(4.4)	100.0
Electricians	7.0(2.8)	53.7(6.7)	0.5(-)	1.8(0.6)	100.0
Carpenters, etc.	2.5(1.0)	85.2(10.6)	4.9(0.1)	1.1(0.3)	100.0
Typists, Clerks, etc.	3.2(1.2)	8.0(1.0)	6.9(0.1)	7.0(2.2)	100.0
Stationary Engine Drivers	36.0(14.4)	22.5(2.8)	23.2(0.4)	3.7(1.1)	100.0
Total Employment in each Industrial Group as % of Federation Working Population	2.5	8.0	64.6	3.2	100.0

Sources and Notes: 1) Compiled from Malaya, A Report on the 1947 Census of Population, Tables 98-101.
2) Bracketed items in columns i to iv show the proportion of the total number of Federation of Malaya workers in each category employed in each industrial group divided by the particular industrial group's workforce as a percentage of total Federation workforce. Thus the proportion (14.7%) of the Federation's fitters (etc.) employed in Mining and Quarrying is 5.9 times greater than the proportion (2.5%) of the Federations' total workforce employed in Mining and Quarrying. Even so, Mining and Quarrying's use of fitters is less marked than that of Manufacturing, Building etc. where the proportion of fitters employed (52.5%) is 6.6 times greater than that industrial group's share in the Federation's workforce (8.0%).
3) Categories are those of the Census. It is not stated what occupations and industries are included in the "etc's".

Europeans have not been employed in artisan, junior supervisory, or clerical capacities since long before the Second World War. Writing in 1916 on tin dredging in Malaya, H.D. Griffiths noted that local skilled labour for workshops was easily obtainable, and that European staff was confined to managers, dredge masters and winchmen. Even at that time European winchmen were being replaced by Chinese.[1] Gravel pump mines, predominantly Chinese, never employed Europeans except in the small minority of European owned mines. Even early accounts of the rubber industry such as D.M. Figart's[2] do not speak of Europeans employed as conductors, mandores, etc.

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[1] Bucket Dredging for Tin in the Federated Malay States, op.cit., p. 19 and p. 26.

[2] The Plantation Rubber Industry in the Middle East, op.cit.

Section VI - 2 Export Industries and the Diffusion of New Technology

VI - 2i Discussion

The literature surveyed in Chapter II stresses the role of technology in promoting growth. Thus Robert Baldwin, a major protagonist of the importance of technology, writes that:

> "Since advanced productive techniques are necessary for a significant rise in per capita income levels in these areas (i.e. underdeveloped countries), a study of those factors that determine the extent and speed of the adoption of new techniques becomes a major topic of development theory."[1]

The analytic core of his argument is that the extent to which export development induces the spread of new techniques depends significantly on the technological nature of the export goods' production function. Moreover, the effects of export expansion in terms of enlarging the internal market and training local labour determine the extent to which new techniques spread throughout the economy.[2] These arguments are virtually identical to the mechanism described by other theorists who treat export induced growth as a theory of capital formation working through a disaggregated multiplier-accelerator mechanism.[3] Whether Baldwin's stress on technology represents a real addition to an understanding of the trade-growth mechanism must therefore be examined.

The role of technology can be approached by separating the growth effects of export expansion into a demand side and a supply side. On

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[1] "Export Technology," op.cit., p. 80.

[2] Ibid., pp. 84-5.

[3] See for instance M.H. Watkins, "A Staple Theory of Economic Growth", op.cit. Labour training effects can easily be considered as a technological externality of capital formation.

the demand side, as was shown in Chapter II, export production offers opportunities for local people to engage in production either of goods required as inputs (either for the export good's current production or in the making of its capital equipment), of goods using the export good itself as an input, or of consumer goods for export sector workers. In addition, local people can participate directly in export good production. All these activities require capital formation and therefore savings. If the export good was not previously produced for local consumption a different technology is also required, by definition.[1] The role of "new" technology here can only be in determining the rate of return on capital. If capital formation is financed by savings withdrawn from elsewhere in the economy (i.e. if export production reallocates rather than augments the domestic supply of capital) an advanced technology may so raise the rate of return as to yield a substantial surplus over alternative investment opportunities, and thereby raise the income and savings potential of local capitalist producers. Moreover, if savings depend to any extent on investment opportunities, savings and domestic capital formation will themselves be raised.

On the supply side, there is a role for technology in improving labour quality and productivity. New technology can improve output per head in the same way as can an increase in capital per head. In a

[1] This problem would not be merely definitional in cases where the export good was previously produced for purely local use, as is the case with rice in Thailand and Burma. Here export production might or might not involve a new technique.

properly functioning allocative system, of course such improvements would be spread over the economy rather than being confined to the industry in which it originated.[1] This could occur without the quality of labour being improved. New technology might however require labour with skills previously rare or unobtainable locally. Local people would be trained to acquire these skills, so improving labour quality. The training of skilled labour of course also generates external economies for other industries which might use that labour.

In all the points set out above, except the last (about labour skills), new technology has had almost exactly the same effect as capital formation. It should not be assumed, however, that a particular technology is the more likely to promote growth in an under-developed country the more "advanced" is that technology. "Advanced" technology frequently (if not usually) implies the use of capital-intensive techniques. A technology which is very much out of line with a country's factor endowment may minimize the spread of benefits of export production. It may offer few opportunities for local production of intermediate products because these are technically too sophisticated for local production. It may employ few workers, thus minimizing final demand linkages though improving factor quality. It may be so advanced that it requires skilled foreign workers who are difficult to replace

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[1] Improved technology would raise existing workers' marginal products. Higher wages would not be paid to existing workers, however, while new workers would be attracted at the prevailing wage rate. In a general equilibrium system attraction of workers from other industries would raise the marginal productivity of workers remaining in the other industries, and hence their supply price. Thus all wages in the economy would rise for that particular type of labour. This mechanism is the same as would operate in the case of an increase in capital per head.

with local people, and economies of large scale production may prevent direct local participation in export good production. These difficulties are recognized by Baldwin and others, yet Baldwin still calls for the adoption of "advanced technology". Perhaps there is more scope for work in developing advanced technology suitable for less developed countries' factor proportions.[1]

VI - 2ii The Malaysian Experience[2]

The return on capital in export good production is only relevant for the demand considerations discussed in Subsection 2i if direct local participation in export good production is possible.[3] Local participation may be prevented for a variety of reasons, perhaps the most important of which is a combination of excessive technical complexity and economies of scale requiring large initial sums (as

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[1] This is the theme of Professor H.W. Singer of the University of Sussex in a paper "Economic Development - the Role of Science and Technology", delivered to the Overseas Development Group seminar at the University of East Anglia, Norwich, 26 May 1971. See also R. Solo, "The Capacity to Assimilate an Advanced Technology", American Economic Review, Papers and Proceedings, May 1966, reprinted in N. Rosenberg (editor), The Economics of Technological Change, (London, 1971).

[2] The information on Malaysia needed for this subsection is drawn from other parts of the study. Detailed references are not given, therefore.

[3] The degree of local participation may range from production almost entirely in local hands, e.g., cocoa in Ghana; to intermediate degrees of local participation as in the Malaysian rubber industry; to almost complete foreign domination, as was the case at least until recently in tin dredging in Malaysia.

in tin dredging, for instance). In rubber cultivation there are few economies of scale,[1] and both smallholdings and smaller estates were developed from an early date by local people. Bauer's famous rubber-rice comparisons[2] show how rubber yielded a much higher return than the main alternative crop. In dredging, large initial capital outlays prevented local participation[3] until very recently. Gravel pump mining in contrast was almost wholly local.[4] Oil palm did not encourage smallholder production, other than on FLDA schemes, because of the technical requirements of the crop.

Intermediate purchases of inputs are described in Chapters IV and V. They were large in tin mining and small in rubber and oil palm. If one thinks of "different" and "new" technologies in terms of productive techniques unfamiliar to the host economy, then tin mining was a major spreader of new technology.[5] Both the industry itself, especially dredging, and its linked industries (electricity supply, and more recently petroleum refining) involved mechanized production and

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[1] This applied to processing too, for outputs of estate size, at least until the introduction of new processing methods under the SMR scheme.

[2] The Rubber Industry, op.cit., pp. 361-362.

[3] Local participation here means the initiation and organization of production by local people. As Chapter IV showed, local people have "participated" in dredging by buying shares for over 20 years.

[4] Of course, this raises the question discussed in Chapter III, of whether Chinese are "local". They are assumed to be "local" in this case because no net immigration took place to provide labour for gravel pump mines. In fact the labour force in tin declined in comparison with the days of dominance by open cast mines.

[5] Even so, the value to the host economy of such new techniques must assert itself in terms of a higher return on capital or in improvements in labour quality.

sophisticated techniques. The contribution of the rubber industry, and of oil palm, to such technological spread is confined mainly to engineering products for processing equipment (discussed in Chapter VIII), except for the newly established chemical fertilizer industry. Final demand linkages, discussed in Chapter VII, were more important in rubber than in mining because of the larger rubber industry wage bill. Also of course rubber introduced to many peasant producers the idea of investment in a product with a long gestation period and returns over a period of years. This lengthening of time horizons can be overstressed however. Rubber trees would be planted in ground cleared near the kampong (village) and left with minimum maintenance until maturity. Meanwhile the peasant could live on his subsistence crop. The spread of rubber among Malays was facilitated by the fact that Chinese provided a network of dealers to collect and sell the rubber, but this also lessened the degree of change required of Malay economic organizations.

Improvements in labour quality and productivity varied considerably between the export industries. Skill requirements have been set out in Section 1. Gravel pump mining represents an excellent compromise between the direct employment of a large number of workers in the wage economy (as in rubber) and the improvement of a small number of workers (as in dredging). The labour coefficients in Table 6 show how labour use relative to output in gravel pumping is twice that of dredging, and somewhat under one third of that of rubber. Gravel pumping pays high wages relative to estates and its wages are comparable to those in manufacturing. Its labour training effects are less than those of dredging but more widespread if the wages of its unskilled workers - which are considerably higher than those of estate workers - are taken into account. Finally, even on

estates wages are over four times what one study has calculated to be the shadow wage of the Malaysian economy.[1] Estate wages are also in excess of average rubber smallholder earnings, which are themselves in excess of the shadow wage.[2] This excess of estate wages over subsistence sector earnings is particularly interesting. Whatever the original effects of large scale immigration from India in reducing wages to the level of an overpopulated underdeveloped country, present estate wages are well above earnings in the subsistence sector.[3]

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[1] I.M.D. Little and D.G. Tipping, "A Social Cost Benefit Analysis of the Kulai Oil Palm Estate, West Malaysia", op.cit., pp. 45-54. Their shadow wage (\$25 a month) is the estimated marginal product of labour in Malaysia, measured as the output of the landless or near landless peasant (p.45). It should be remembered however that a shadow wage as used, say, in a planning model is not necessarily equal to the social marginal product of labour. See Hornby, "Investment and Trade Policy in a Dual Economy", op.cit., p. 101.

[2] On the average 1966 rubber holding in West Malaysia of 6.4 acres, 1.5 workers would be employed, giving a labour intensity of 4.2 acres per worker compared to 7.3 on estates. With high yielding material and f.o.b. prices of 50 cents/lb. this gives a net monthly return per worker of \$110, slightly below the average estate wage. With low yielding material this would fall to \$55, less than half the estate wage. A rise in the rubber price (53 cents/lb in 1968) would of course raise these returns. According to the RSH 1968 at least 720,000 acres (27% of smallholding 1968 acreage) were planted with old (low yielding) rubber. Smallholding incomes from Barlow and Chan, "Towards an Optimum Size of Rubber Holding", op.cit., pp. 22-23. Barlow and Chan's figures can be compared to those of Fisk's Rasa study, where average income per family member is \$13 or \$31 per worker assuming Barlow and Chan's worker dependents ratio of 1:1.3. The average potential household land holding in Rasa was 8 acres which is the basis for the above figures. In fact, 42% of households owned no land. (See Fisk, "Productivity and Income from Rubber in an Established Malay Reservation", op.cit, especially p. 19). However, in the Ulu Selangor study by Fryer and Jackson, average Chinese rubber smallholdings were 6.8 acres yielding average monthly income of \$181 with price of 63 cents/lb, compares to Barlow and Chan's \$164 with high yielding material. (See Fryer and Jackson, "Peasant Producers or Urban Planters ?", op.cit., p. 209). In comparison, the average monthly income on an FLDA scheme, assuming a rubber price of 50 cents/lb, would be \$149 a month for a ten acre holding (\$112 for an eight acre holding) for the first fifteen years of tapping, after deducting loan repayments of \$172 a month (\$144 for an eight acre holding). (FLDA, A Review of the FLDA, op.cit., pp. 27-28.)

[3] Some useful generalizations on the effects of immigration into countries such as Malaysia are to be found in H. Myint, The Economics of the Developing Countries, op.cit., pp. 53-68.

In all export industries technical progress has occurred since their original introduction into Malaysia. In dredging this has taken the form of increasing economies of scale, as dredges of up to a million cubic yards a month capacity have been built. Thus direct local participation in dredging has been made more difficult. In oil palm too, factories also have grown in size and total cost. In view of the need for quick transmission of harvested fruit bunches to the factory, smallholder participation in oil palm in any case is difficult, except on organized schemes. In gravel pumping the major innovation has been the use of jigs for both primary treatment and retreatment. This has tended to reduce the overall labour intensity of production, while slightly raising the skill content.[1] In rubber the dominant technical advance has been the use of increasingly high yielding material for planting. This technical progress is "neutral" in the sense of raising the productivity of both labour and capital inputs while leaving the capital-labour ratio unchanged.[2] Technical progress in rubber processing under the Standard Malaysian Rubber Scheme had meant large economies of scale in rubber processing. In fact, rubber growing can be split from processing. Smallholders can operate their small plots efficiently while selling their latex to central factories for processing. Technical progress in tin, and in rubber and oil palm processing has not prevented the local purchase of many items of capital equipment, discussed in Chapter VIII.

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1 Workers displaced would be those who cleaned the palong, and dulang washers who panned tailings. They would be replaced by a smaller number of more skilled workers to maintain and supervise the jig plants.

2 This is "neutrality" in the Hicksian sense. For a convenient discussion of this and other types of neutral technical progress see R.G.D. Allen, Macro-Economic Theory, op.cit., pp. 236-257.

TABLE VI - 8 CAPITAL INTENSITIES AND RATES OF RETURN IN TIN MINING, AND RUBBER AND OIL PALM ESTATE CULTIVATION

	(i) INTERNAL RATE OF RETURN (PRIVATE)	(ii) INTERNAL RATE OF RETURN (SOCIAL)	(iii) CAPITAL-NET OUTPUT RATIO 1968	(iv) NON-WAGE VALUE-ADDED PER WORKER ($) 1968
Gravel Pump Tin Mining	over 50%	...	0.5	5,710
Tin Dredging	23.5%	...	1.9	11,310
Rubber Estate Cultivation	11%	15%	2.5	1,160
Oil Plam Estate Cultivation	17%	23%	3.3	1,520

Sources and Notes: 1) Oil palm and rubber private rates of return from Bevan and Goering "The Oil Palm in Malaysia. An Estimate of Product Prices and Returns to Investment", op.cit., p. 159. Oil palm and rubber social rates of return are from Little and Tipping, op.cit., p. 71, who re-work the Bevan-Goering analysis using shadow prices for inputs. The Little and Tipping results assume that any additional savings resulting from oil palm and rubber projects are not valued more highly than any additional consumption.
2) For the sources and methods of all other calculations see Appendix VI - 1.

Finally, since use has been made in this chapter of concepts of capital intensity and rates of return, some estimates of these qualities for the export industries are set out, in Table 8. The very high rate of return in gravel pumping should be treated with some suspicion[1] but even very low assumptions about costs and about durability of equipment would not reduce it to below 25%. The Bevan-Goering private rates of return for rubber and oil palm would be slightly higher if export duty (5% for rubber and 7.5% for oil palm) had been added to net revenues.

Differences in the capital-net output ratios within the tin sectors and within the estate sectors are associated with differences in non-wage value-added (NWVA) per head, although in dredging the greater

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[1] See Appendix VI - 1. Both tin estimates should be regarded as rough orders of magnitude only.

durability of capital equipment makes for a larger difference in the former relative to the latter measure. NWVA is probably the best available indicator of the flow of capital services per head. Gravel pump mining's NWVA is of comparable magnitude to that in manufacturing ($5024),[1] while dredging's is much higher, and those of the estate sectors very low. The high estate capital-output ratios reflect the durability of investment in factories and land clearing and planting - investments are expected to yield returns over 25 to 35 years.

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[1] CManI, 1968.

CHAPTER VII

FINAL DEMAND LINKAGES

This chapter examines final demand linkages generated by export sector[1] factors of production. Section 1 presents a breakdown of the expenditure of workers in the tin and rubber industries, and of rubber smallholders. Section 2 discusses export multiplier effects in macro-economic terms.

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[1] For convenience, the term 'export sector' is used in this chapter to refer to the tin and rubber industries only.

Section VII - 1 Export Sector Consumption Expenditures

The principal source of information on consumption expenditure in Malaysia is the Household Budget Survey of the Federation of Malaya, 1957-58, published by the Department of Statistics. The Survey gives detailed breakdowns of expenditure, commodity by commodity for Malay, Chinese, and Indian households. For each group, information is given separately for households in rural areas and households in urban areas. For each of the six groups (rural Malay, urban Indian, etc.) consumption expenditure is split further according to six income categories.[1]

The aim of the present exercise is to determine what are the consumption expenditures made by export sector workers and smallholders,[2] then to split these expenditures into their local and foreign (i.e. import) components, and finally to examine the effects of the local expenditures. Given the form of the expenditure data, the first step is to determine what proportion of the wage bill (or of total export income in the case of smallholders) accrues to each racial group. Second, it must be decided into which income category the various households fall, and, third, whether the households are rural or urban.

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[1] Monthly incomes of $1 - $150, $151 - $300, $301 - $500, $501 - $1000; income not definite, and total all incomes.

[2] There is insufficient information on the incomes of export sector shareholders to determine consumption expenditures of dividend receivers in Malaysia. It is known that the majority of shareholders are Chinese, however. See the works cited in Chapters IV and V by Yip and Mamajiwala, respectively, on share-ownership in tin dredging and rubber estates.

TABLE VII - 1 DISTRIBUTION OF WAGE BILLS BY RACIAL GROUP, 1968

		(i) PROPORTION OF EACH RACE IN 1968 WORK-FORCE	(ii) WAGE BILLS ($000)	(iii) ROUNDED WAGE BILLS ($M.)
Rubber Estates (Wage Bill: $242.262m.)	Indians	0.46	111,440	111
	Chinese	0.31	75,101	75
	Malays	0.23	55,720	56
Gravel Pump Tin Mines (Wage Bill: $55.628m.)	Indians	0.06	3,338	3
	Chinese	0.83	46,171	47
	Malays	0.10	5,563	5
Tin Dredges (Wage Bill: $25.469m.)	Indians	0.24	6,113	6
	Chinese	0.37	9,424	10
	Malays	0.37	9,424	9

Sources and Notes: 1) Column i from HLS 1968.
2) Total Wage Bills from Appendix V - 6 for rubber, and Appendix IV - 8 for tin. Wage bills exclude managerial and professional salaries, which frequently accrue to expatriates in estates and dredges.
3) Column ii derived by multiplying Total Wage Bills by column i.
4) Chinese Wage Bills in tin mining in column iii are rounded upwards to take account of the fact that Chinese tend to occupy more skilled positions.

Table 1 shows the wage bills paid to each racial group on rubber estates, gravel pump tin mines, and tin dredges. The total wage bills have been split first according to the proportions of each race in the workforce. In rubber earnings differ little between the races. In mining, Chinese tend to occupy the more skilled positions, hence Chinese wage bills have been adjusted upwards, and Malay and Indian wage bills downwards, in the rounded wage totals. Table 2 shows the distribution of income among smallholders by racial group. An arbitrary 20% of Malay income has been reallocated to Chinese in the rounded figures to take account of the fact that much Malay-owned land is actually operated by Chinese.[1]

[1] See Fisk, "Productivity and Income from Rubber in an Established Malay Reservation", op.cit. Fisk's findings are discussed in Section V - 1.

TABLE VII - 2 DISTRIBUTION OF SMALLHOLDER RUBBER INCOME BY RACIAL GROUP, 1968

	(i) SHARES OF 1952 SMALLHOLDER ACREAGE	(ii) FAMILY RETURN FROM RUBBER ($000)	(iii) ROUNDED FAMILY RETURN FROM RUBBER ($M.)
Indians	0.08	21,553	22
Chinese	0.41	110,460	137
Malays	0.47	126,625	100

(Total Smallholder Family Return = $269.415m. = 50% of value of Smallholder Rubber Exports, 1968).

Sources and Notes: 1) Column i from Table V - 10. No more recent figures are available. Malay acreage will have increased as a result of participation in FLDA schemes, while Chinese acreage has risen because of estate subdivision and ohter purchases of existing rubber land. See Chapter V, Sub-Section 1i.
2) Family Return is the difference between net smallholding revenue from rubber, and all costs except family labour. Barlow and Chan, "Towards an Optimum Size of Rubber Holding", op.cit., p. 17, calculated that the family return in 1968 was from 28.4 to 30.0 cents/lb., depending on the type of planting material. These figures are approximately 50% of the 1968 net export unit value (from Appendix V - 3).
3) Column ii calculated by distributing Total Smallholder Family Return according to column i shares of acreage.
4) Case studies of Malay and Chinese smallholder areas indicate that Malay-owned rubber land is often worked by Chinese on a share-cropping basis (See Subsection V - 1i). Thus the rounded figures in column iii include an arbitrary transfer of 20% of Malay income to Chinese. This may still understate the Chinese share, but it is a correction in the right direction.
5) In calculating family return the proportion of gross income retained on FLDA schemes, which is likely to differ from 50% (see note 2) is disregarded, since FLDA schemes in 1968 accounted for only 5% of smallholder acreage (RSH, 1968).

The estimation of household income raises a particular problem in the case of rubber estate workers. Normally a household may consist of a wage earner and his dependents. In rubber estates however nearly half the labour force is female[1] and other available information[2] suggests that in many Indian households living on estates[3] there are

[1] In 1968 47% of the rubber estate labour force was female, 3% were young persons, and 50% were males. (HLS 1968).

[2] Information is mainly from my own visits to estates in 1969.

[3] In 1968, 77% of the rubber estate labour force was provided with free accommodation (on estates). See HLS 1968. Since Indians are only 46% of the labour force on estates (see Table 1) it follows that many Chinese also had free accommodation on estates (assuming that Malays would tend to come from nearby villages). Accommodation on-estate tends to increase the chance of several family members in individual households working on the estate.

both male and female wage earners. This seems also to be true, but to a lesser extent, of Chinese. Unfortunately no cross-classification is available of the estate labour force by race and sex. The nearest cross-classification is in the 1957 Population Census, which refers to all employees in rubber planting, including a minority of workers employed on smallholdings. For employees in rubber planting the ratio of males to females was 1.31 for Indians, 1.24 for Chinese, 1.47 for all workers, and 1.97 for Malays.[1] On the strength of this information, and given an average estate wage in 1968 of $98 a month with little variation around the mean, it has been decided to put Indians and Chinese in the $151-$300 a month category and Malays in the $-$150 category.

In gravel pump mining, the 1968 average wage was $114,[2] and all groups are placed in the $1-150 category. In dredging, the average wage was $140,[3] and Chinese tended to occupy skilled jobs with higher wages than the average, while Indians and Malays did less skilled jobs. Hence Chinese are placed in the $151-$300 group, and Malays and Indians in $1-150.

In the rubber smallholding sector the average size of holding is 6.6 acres.[4] Malays tend to have holdings well below the average size and Chinese have holdings above it. Barlow and Chan calculate that the family return per acre, at the 1968 rubber price is $308 per annum if

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[1] 1957 Population Census of the FM, Report Number 1.

[2] See Appendix IV - 8.

[3] Ibid

[4] Barlow and Chan, op.cit., p. 3.

high-yielding material is planted, and $154 for low-yielding material. 6.6 acres gives family returns of $169 and $85 a month for high and low yielding material, respectively.[1] On this basis Malay and Indian households are put in the $1-150 category, and Chinese households in the $151-300 category. Of course, these classifications, like those for wage earners on estates and mines, are rather abritrary. It should be remembered, however, that the purpose is not to estimate exact income, but to decide which consumption pattern to use in the analysis which follows. Another difficulty is that various household members may work in several industries, thereby perhaps raising household income above the limits chosen here. Little quantitative information is available on this point.

The final step in determining which consumption patterns to use is to decide whether households are rural or urban.[2] In the case of estate workers, and workers on gravel pump mines and dredges, most of whom live at their place of work,[3] households are assumed to be rural. Malay and Indian smallholders are also assumed rural. However, during the Emergency many rural Chinese were relocated to New Villages, often with populations of over a thousand. For this reason Chinese smallholders are classed here as urban.[4] Table 3 summarises the classifications chosen.

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[1] Ibid., p. 17.

[2] In the HBS no definition is given of 'urban'. It is assumed here that 'urban' is defined as in the 1957 Population Census: "gazetted administrative areas with a population of 1000 or over." (Report No. 14).

[3] In 1968 78% of rubber estate workers, and 82% and 56% of gravel pump and dredge workers, respectively, were provided with free accommodation (which is virtually always on-site). See HLS 1968.

[4] In support of this classification see Fryer and Jackson, "Peasant Producers or Urban Planters? The Chinese Rubber Smallholders of Ulu Selangor," op.cit.

TABLE VII - 3 CLASSIFICATION OF HOUSEHOLDS IN RUBBER PLANTING AND TIN MINING

		URBAN (U) OR RURAL (R)	INCOME GROUP ($ PER MONTH)	WAGE BILLS ($M.)
Rubber Estates	Indians	R	151-300	111
	Chinese	R	151-300	75
	Malays	R	1-150	56
Rubber Smallholdings	Indians	R	1-150	Family(22
	Chinese	U	151-300	Return(137
	Malays	R	1-150	(100
Gravel Pump Mines	Indians	R	1-150	3
	Chinese	R	1-150	47
	Malays	R	1-150	5
Dredges	Indians	R	1-150	6
	Chinese	R	151-300	10
	Malays	R	1-150	9

Sources and Notes: 1) See text for discussion of methodology.

Having decided into which income group each race of worker (or smallholder) in the tin and rubber industries should fall, and whether they are urban or rural, the proportions of total income spent on particular goods by each of the six groups in Table 3 are multiplied by the total income of each group (from Tables 1 and 2) to determine the group's demand for the goods in question.[1] The Household Budget Survey lists monthly income spent on each of about 200 goods. To reduce the calculations involved, goods on which none of the six groups spent at least 1% of income were omitted. This reduced the coverage to about 75% of total consumption expenditure[2]. The demands of each group for each good are summed in order to arrive at the total demand by

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[1] This involved over a thousand separate calculations as well as a similar number to convert the original consumption data from absolute figures to percentages. I am most grateful to the Departmental Assistants in the School of Social Studies at the University of East Anglia who spent several weeks doing these calculations under my direction.

[2] See Table 4, note 3.

TABLE VII - 4 CONSUMPTION EXPENDITURE OF WORKERS IN THE TIN AND RUBBER INDUSTRIES, AND OF RUBBER SMALLHOLDERS, WEST MALAYSIA, 1968

	(i) TOTAL EXPORT SECTOR DEMAND ($MIL)	(ii) / (i) NET IMPORTS
Food		
Rice (polished)	77.7	0.8
Rice (parboiled)	8.1	0.3
Wheat Flour	3.1	-0.6
Bread	4.3	44.8
Biscuits	5.3	2.2
Buns, Cakes, Pies	12.3	9.3
Potatoes	1.8	0.4
Sugar	17.8	0.3
Bean Curd	2.2	...
Dhall (a cereal)	1.5	0.3
Coconuts	3.3	-11.3
Beef	4.7	1.1
Mutton	4.2	1.4
Pork	20.3	50.3
Miscellaneous Carcass Meat	5.0	0.9
Fowl	9.5	10.9
Kembong (fish)	4.1	...
Other Fresh Fish	14.8	...
Prawns and Shrimps	4.8	...
Preserved Fish	13.7	....
Duck Eggs	4.0	2.9
Fresh Milk	1.6	-11.6
Condensed Milk	14.9	-1.0
Coconut Oil	6.5	9.1
Coffee	5.6	1.4
"Other Curry Stuff"	1.6	22.0
Meals Out	21.4	NT
Drink and Tobacco		
Beer	2.1	0.6
Stout	3.9	-0.6
Toddy (an alcoholic drink)	7.1	NT
Cigarettes	19.0	-5.8
Cigars	3.1	18.4
Tobacco	4.4	10.9
Sirah, Betel, and Other Nuts	1.4	NT
Manufactures		
Sarong (article of clothing)	3.2	1.5
Cotton Material	7.3	0.2
Other Materials and Tailoring Charges	3.6	0.5
Durable Household Goods	4.4	0.1
Joss Sticks, etc. (religious object)	2.3	3.8
Kerosene	5.4	-0.9
Books and Periodicals	3.2	0.3

TABLE VII - 4 (continued)

	(i) Continued	(ii) Continued
Utilities and Services		
Firewood	8.6	NT
Electric Power	2.5	NT
Bus Fares	6.1	NT
Other Fares	5.8	NT
Cinema	3.6	NT
Haircuts and Shaves	3.4	NT
School Fees	8.5	NT
Medical Fees	2.7	NT
Internal Eastern Medicine	3.2	...
Charity and Gifts	8.2	NT
Loan Repayments	13.6	NT
Pocket Money	10.8	NT
Miscellaneous Expenditure	6.1	...
Rent and Rates	14.9	NT

Total Expenditure on Items Listed above: $442.5m.

Total Expenditure on Items with Column ii Value of ≷ 1.0: $4.7m. (= 1.1% of Total Expenditure on items listed above)

Sources and Notes: 1) Consumption data calculated from HBS (see text for discussion of methodology). Net Imports are Imports less Exports and Re-exports, from ASET, 1968.
2) NT = non-traded good. A negative entry indicates positive net exports.
3) The items listed above account for 74% (in the case of rural Chinese with incomes of $151-300 a month) to 81% (for rural Indians with $1-150 a month) of total expenditure. A necessary and sufficient condition for an item to be included in the table is that one or more of the six income-racial groups should spend at least 1% of their income on that item.

the tin and rubber industries for the good in question.[1] These demands are shown in column i of Table 4, which summarises the results of the analysis.[2]

For most of the fifty or so goods in Table 4, local production data do not exist, so that the measure of local market share set out in Chapter III cannot be used.[3] Instead, consumption can be compared

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1 Demands are summed because it would be difficult to use the Table 4 column ii measure (discussed below) for relatively small individual groups.

2 Since savings are not included in the HBS analysis, consumption demands will be overstated to the extent that incomes exceed expenditures. It is unlikely, however, that savings for export sector workers are more than 5% of income. See Little and Tipping "Social Cost-Benefit Analysis", op.cit., p. 58.

3 This measure was: $\dfrac{\text{Local Production}}{\text{Local Production + Net Imports.}}$

to net imports. In column ii of Table 4 total demand is divided by net imports. If the export sector households concerned constituted the whole population of West Malaysia, a column ii figure of 1 would indicate demand equal to imports (i.e. demand satisfied by imports, with no local production). In fact, workers (and smallholders) in tin and rubber are just over 30% of the West Malaysian working population.[1] If their ratio of workers to dependents is roughly the same as for the rest of the population,[2] and their consumption patterns broadly similar,[3] a figure of 0.3 in column ii would indicate that export sector demand was met entirely by imports. A column ii figure of 1 would show that demand was three times larger than imports (i.e. imports met only a quarter of total export sector demand). In Table 4 a column ii figure of 1 is chosen as a cut-off, above which export sector demand is assumed to be met from local production. Only 1.1% of the value of consumption in Table 4 (equal to 0.8% of total consumption) is of goods where imports meet more than a quarter of local demand. Items for which no suitable import statistics are available constitute only another 11%, and 5% points of that is fresh fish which is almost certainly locally caught. Allowing

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[1] Tin and rubber estate labour forces from Appendices IV - 3 and V - 2. Smallholder figure (445,000) from Barlow and Chan, <u>op.cit</u>., p. 6. Working population, and ratio of working to total population from <u>MBS</u> June 1970.

[2] In fact the ratio of dependents may be less in both estate and smallholder sectors of the rubber industry where many families have several working members. This would mean that the column ii cut-off figure of 1 discussed above would show an even smaller proportion of demand met by imports.

[3] The rubber and tin industries contain large groups of all three major races, although the predominance of Indians in estate rubber would bias consumption slightly towards Indian patterns. However Indians consume very few goods not also consumed by other communities.

for the import component in items with a coefficient of more than 1, at least 70% of Table 4 expenditure appears to be local.

The composition of local consumption expenditure as well as its total size is important in determining its development effects. New technology may be introduced if consumers demand more sophisticated products.[1] In fact about 65% (at least) of expenditure[2] is on food, though it includes the high figure of 5% points on meals out. Manufactured foodstuffs include sugar (4% of expenditure), which is refined locally, various bakery products (1%), and condensed milk (3%). Beer is also brewed locally. Non-food manufactured items include cigarettes (4%), and a few small items. "Modern" expenditure on services includes cinema tickets and bus fares, each about 1% of expenditure.

Thus households workers in the two export industries still spend the bulk of their income on simple foodstuffs, while manufactured commodities and Western-type services are but a small proportion of expenditure.[3] However, these results exclude managers and executives for whom no adequate data are available,[4] and who would earn an amount

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[1] See for example Baldwin, "Export Technology and Development from a Subsistence Level," op.cit., discussed in Subsection II - 3iii.

[2] The figure is higher than 65% because excluded items include some foodstuffs. The figure for all households is 67% (see HBS). Unless otherwise stated, proportions of expenditure here will refer from now on to proportions of the $442.5m. shown in Table 4.

[3] These results can be compared to the average of 20-30% of income spent on food in developed countries. See Kuznets, Modern Economic Growth, op.cit., pp. 266-67.

[4] In any case, many managerial personnel on rubber estates and tin dredges are expatriates, wage payments to whom should not be considered as local earnings and much of whose expenditure may be on imported consumer goods.

equivalent to another 10-20% of the wages bill.[1]

[1] In this context it may be noted that the highest quoted income group of Chinese (urban Chinese earning $501-1000 a month), who would provide tbe bulk of local management personnel, still spent almost 50% of their income on food. (See HLS).

Section VII - 2 Export Sector Multipliers

In Subsection II - 3vi some aggregate relationships between export earnings, savings and consumption were discussed. Included was a study by Pierre Crosson of the Federation of Malaya, 1955-62, where he found that the marginal propensity of the whole economy to save with respect to changes in export income was 0.63, rising to 0.81 if net factor payments abroad were added to domestic savings.[1] Crosson suggested that domestic savings depended crucially on export sector taxes and export sector profits, and that marginal export income accrued primarily to profit-receivers, and to government (as export taxes).[2]

If, as a simplifying assumption, export sector workers are assumed not to save,[3] and export sector profit-earners not to consume their income from profits, then the marginal propensity to consume of the export sector will depend on the relationship between export earnings and total wage payments. The marginal propensity to consume (MPC) in turn determines the export multiplier and thereby the possibility of multiplier-accelerator effects from export income. In order to estimate the MPC of each export industry (rubber estates, gravel pump tin mines, and tin dredges[4]), annual wage bills were regressed first on same year export

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1 "Exports and Economic Growth: Malaya, A Case Study", op.cit., p. 18.

2 Ibid., p. 21.

3 They must also be assumed to pay little or no marginal income tax. Under Malaysian income tax laws, the first $3000 of annual income is free of tax for a married man. Hence few export sector workers would pay tax. Straits Times, Malaysia Yearbook 1970, op.cit., p. 270. The HBS does not give savings data.

4 Data do not permit the calculation of an MPC for smallholder rubber.

TABLE VII - 5 REGRESSIONS OF WAGES ON EXPORT INCOME ON RUBBER ESTATES AND TIN MINES, WEST MALAYSIA, 1946-68

		REGRESSION COEFFICIENTS a		REGRESSION COEFFICIENTS b	r^2	DW
Rubber Estates (\$242.3m.)						
Unlagged	y_t =	212.83591^* (8.38686)	+	$0.06269x_t$ (2.03972)	0.20637	0.77140
Unlagged First Differences	$y_t - y_{t-1}$ =	−1.41929 (−0.26092)	+	$0.04448^*\ x_t - x_{t-1}$ (2.18375)	0.24123	2.38851^*
Lagged	y_t =	229.86155^* (8.26996)	+	$0.03908x_{t-1}$ (1.17185)	0.08387	0.64663
Lagged First Differences	$y_t - y_{t-1}$ =	0.67389 (0.11954)	+	$0.03106x_{t-1} - x_{t-2}$ (1.51660)	0.14111	2.75412
Gravel Pump Tin Mines (\$55.6m.)						
Unlagged	y_t =	5.78569^* (3.71679)	+	$0.11986^*\ x_t$ (16.15801)	0.92555	1.48511^*
Unlagged First Differences	$y_t - y_{t-1}$ =	0.01973 (0.01612)	+	$0.12735^*\ x_t - x_{t-1}$ (3.97806)	0.44173	2.80668
Lagged	y_t =	7.51880^* (4.13027)	+	$0.12348^*\ x_{t-1}$ (13.27635)	0.89810	1.40110^*
Lagged First Differences	$y_t - y_{t-1}$ =	0.04702 (0.03430)	+	$0.11419^*\ x_{t-1} - x_{t-2}$ (3.25601)	0.35814	2.36307^*
Tin Dredges (\$33.1m.)						
Unlagged	y_t =	8.57305^* (3.53673)	+	$0.09276^*\ x_t$ (7.51813)	0.72911	0.96167
Unlagged First Differences	$y_t - y_{t-1}$ =	0.38306 (0.44129)	+	$0.06781^*\ x_t - x_{t-1}$ (3.02998)	0.31462	2.64220
Lagged	y_t =	11.71472^* (4.74625)	+	$0.08020^*\ x_{t-1}$ (6.34712)	0.66825	1.52454^*
Lagged First Differences	$y_t - y_{t-1}$ =	0.57625 (0.54011)	+	$0.02278x_{t-1} - x_{t-2}$ (0.84227)	0.03599	2.44544^*

Sources and Notes: 1) y is the wage bill in \$million, and x is export income in \$million. The t subscripts refer to years.
2) Rubber calculated for 1951-1968 only, because of missing wage data for 1946-1950. 1968 sector wage bills are shown in brackets after each sector heading.
3) Wage bills from Appendices V - 6 and IV - 8 for rubber and tin, respectively. Export income calculated from outputs and export unit values from Appendices V - 1 and V - 3 for rubber and IV - 2 and IV - 4 for tin.
4) Values of student t statistics are shown in brackets under the values of the coefficients. Starred coefficients are those which are significant at the 5% level. Starred DW (Durbin-Watson) statistics indicate that there is no positive or negative serial correlation at the 5% level.

earnings and then on previous year export earnings. The relationship used was a simple linear one. First differences were also calculated to remove the serial correlation which occurred in several cases. Results of the regressions are given in Table 5.

The relationship between total wage payments in rubber and rubber export income is weak. In no case is r^2 more than 0.24. All but the unlagged first differences are subject to either positive or negative serial correlation.[1] The unlagged first differences (and the other regressions) suggest an MPC of only 0.04 to 0.06, and of 0.03 with respect to the change in export income between the previous year and the year before that (i.e. $x_{t-1}-x_{t-2}$). Moreover, the Student _t_ statistics indicate the b may not be statistically significantly different from zero at the 5% level except in the unlagged first differences case. What is striking is the very large intercept in the two equations using the original variables (i.e. where first differences have not been taken.[2]). This is $213m. and $230m. in the lagged and unlagged cases, respectively, which are figures nearly at the level of the total 1968 wage bill of $242m. Thus in the rubber estate sector wage payments vary hardly at all with export earnings.

In gravel pump tin mines a quite different situation obtains. For both equations using original data (neither of which is subject to serial correlation), r^2 is very high, and both intercepts and the _b_ coefficients (i.e. MPC) are significant at the 5% level. Nevertheless, the MPC is still quite small, about 0.12, although the relationship is a strong one. The lagged first differences suggest that wage payments may also rise in response to changes in export income between the previous two periods.

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[1] For an explanation of this and other statistical terms see Subsection IV - 3v.

[2] No obvious economic meaning can be attached to the intercept in the first differences case.

In dredging, results are similar to gravel pumping, although the MPC's are lower. The lagged original data are not subject to serial correlation. They indicate a fairly close (though not very close) fit, and show an MPC of about 0.08 combined with an intercept which is small relative to the wages bill.

To summarize: the regressions indicate low MPC's ranging from 0.03 to 0.12. In the case of rubber estates the MPC does not seem to be statistically significantly different from zero except in the unlagged first differences case. In the two tin sectors, the MPC's seem low[1] but are statistically significantly different from zero. The largest export multiplier generated is that of gravel pumping, which is 1.14,[2] still very small.[3] Of course, the <u>average</u>

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[1] The apparent lowness, however, must be seen against the fact that for the 1947-66 period the actual proportions of wage payments in total output value were at most 0.25 for gravel pumping (see Tables IV - 11 and 25) and 0.15 for dredging (Tables IV - 11 and IV - 24). These figures, together with the calculated values of the <u>b</u> coefficients, indicate that a doubling of total output value would be matched by proportionate increases of about 50% in wage payments. In the rubber industry, in contrast, where wage payments were equal to over 40% (Tables V - 18 and V - 27) of the value of output, a <u>b</u> coefficient of, say 0.04 indicates that a doubling of total output value would be matched by only a 10% rise in wage payments.

[2] The multiplier is $\frac{1}{1 - MPC}$ in this simple case.

[3] These results may be compared to those of C.H. Harvie, "Export Multipliers and the Stability of the Federation of Malaya's Economy", <u>Malayan Economic Review</u>, April 1964. Harvie estimated export multipliers for the 1955-60 period ranging from 1.06 to 1.34 (p. 86). He suggested that the lowness of these multipliers was the result of high marginal export, taxation and a high marginal propensity to remit export profits abroad. One may note however that the marginal rate of export tax is almost three times higher on tin than on rubber, yet it is the former which has the higher multipliers.

propensity to consume is much higher than the marginal propensity, so that much of total export income is still channelled into the domestic economy.

The differences between the tin and rubber MPC's probably lie in the ability of mines, especially gravel pump mines, to increase output, and thereby increase employment and wage bills, when prices rise.

CHAPTER VIII

EXPORTS AND THE MALAYSIAN ENGINEERING INDUSTRY

This chapter presents an analysis of the relationship between the export industries discussed in this study - tin and rubber - and the development of engineering in Malaysia. Oil palm, the third major export industry is also discussed.[1] Oil palm factory capital costs are presented in an Appendix VIII - 2, while tin and rubber capital costs are in Sections IV - 5 and V - 4, respectively.

Section 1 discusses briefly the choice of the engineering industry as a case study. Section 2 sets out the engineering demands generated by the export industries, and examines the extent to which local production has developed to meet these demands. For this section exports are split into four sectors - tin dredging, gravel pump tin mining, rubber processing and palm oil processing. Oil palm and rubber field operations do not generate significant engineering demand. Engineering demand works mainly through capital (and replacement) purchases. Current purchases of engineering products, other than for replacement, were shown in Chapters IV and V to be insignificant and are not dealt with here.

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[1] In addition some information has been collected, as a byproduct, on engineering production for another important export industry, the production of sawn timber. This information is included where it seems appropriate, e.g. for comparison with the economic organisation of engineering production for other export products.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Section 3 looks at the relative importance of production for exports in Malaysian engineering, and of engineering in the Malaysian economy. It also examines certain quantitative aspects of the industry not dealt with in Section 2.

A sample survey of the largest mechanical engineering industry is described in Appendix VIII - 1, and its results are used throughout the chapter.

Section VIII - 1 Engineering as a Case Study

Several industries suggest themselves as choices for a case study of export sector linkages. They include electricity supply for tin mining, and the production of chemical fertilizers for estates, as well as engineering itself. Electricity supply is largely a non-traded good, owing to the limited distances over which power can be transported. Thus it fails to provide scope for study of a process of import substitution over time in response to changes in local factor supply and quality. Chemical fertilizer production owes its existence in Malaysia to tariff protection and tax incentives.[1] A study of this industry would be tantamount to a study of government import substitution policy. While this is both interesting and important, an analysis of an industry which has developed in response to market forces is more relevant to this study.

Engineering is of particular interest to less developed countries. First, as a manufacturing industry it represents the use of quite different productive techniques from that of an export sector producing primary commodities.[2] Evidence presented in Section 3 shows that it was one of the earliest manufacturing industries to develop in Malaysia. Second, it is potentially an important training ground for skilled labour,

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[1] See Section V - 3.

[2] See Subsection II - 3iii for a theoretical discussion of the role of exports in introducing new technology into less developed countries. See also Section VI - 2.

whose existence would provide external economies for the further development of manufacturing.

These remarks would apply to almost any "modern" manufacturing industry.[1] However, engineering is sometimes assumed to be more important for further industrial development than just any manufacturing industry.[2] A United Nations conference on science and technology for less developed regions stated: "There can be no industrial development without a substantial electrical and mechanical engineering industry .... Machinery and electrical equipment are the foundations of an industrial economy."[3] Certainly most developed countries, including Japan, have substantial engineering industries, which usually account for over 30% of manufacturing output.[4] It does not follow from this fact that a country which acquires an engineering industry early in its development necessarily will experience faster industrial growth than

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[1] Manufacturing in Malaysia also includes many "traditional" activities such as rubber remilling, and carpentry. The term "modern" is difficult to define, but certainly one criterion would be the extensive use of powered machinery.

[2] This is reflected in the fact that the Mid-Term Review of the First Malaysian Plan 1966-70 (pp. 73-74) singles out "industries manufacturing capital or intermediate goods for which extensive markets already exist or are in prospect, e.g. machinery for rubber and palm oil processing and for lumber mills," as one of the four types of manufacturing activity to which special encouragement should be given. In fact, little specific encouragement has been given to these industries to date, other than to the Malayawata steelworks. A study of Malayawata is outside the scope of this chapter.

[3] Science and Technology for Development, Report on the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas. Volume IV, Industry, (New York, 1963), p. 77.

[4] See S. Kuznets, Modern Economic Growth. Rate, Structure and Spread, op.cit, pp. 135-143, and UN, Science and Technology for Development, op.cit., Volume IV p. 77.

one which does not. Nevertheless it is at least intuitively plausible that the existence of repairing and structural engineering facilities could produce externalities for other manufacturing. Moreover, an engineering industry would help spread what Solo has called the "Cognition of mechanism", a recognition of the value to society of mechanization and of the use of technical skills.[1] Whether in general the ability of a country to produce its own producer goods[2] at an early stage, rather than importing them, is an important factor in development which needs further examination and is outside the scope of this study.

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[1] R. Solo, "The Capacity to Assimilate an Advanced Technology", op.cit., pp. 486-7.

[2] It must be remembered of course, that engineering production especially in the electrical and transport branches, also produces substantial proportions of output for final demand use.

Section VIII - 2 Engineering Production for Export Industries

The material for this section was collected mainly by interviews conducted in Malaysia from September to December 1970. The procedure used for each of the four export sectors studied was first to interview major firms producing the export good. From these firms were obtained data on capital costs and replacement expenditures involved in export production.[1] In many cases they were also willing to give the names of the main suppliers of their equipment.[2] Often the engineering firms thus identified were large European concerns.[3] These were interviewed and where their work was subcontracted the names of the subcontractors were obtained, and they also were interviewed.[4] From the subcontractors were obtained names of other non-European firms in their field, and so on.

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1 It will be clear from Chapters IV and V that demand for engineering products comes from capital and replacement purchases rather than current payments.

2 Another source of information about suppliers was the Straits Times Directory 1970. The Rubber Research Institute also provided a list of suppliers of SMR rubber machinery.

3 It is worth repeating that a "European" firm in this study is a firm founded by Europeans and usually with European predominance on the board of directors. It is neither necessarily a subsidiary of a firm operating overseas nor is its present share ownership necessarily predominantly European. Chinese and other Malaysian firms are normally both owned and controlled by, and employ, Malaysians.

4 It will be shown below that subcontracting has been important in the growth of local non-European engineering.

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[illegible]

[illegible]

[illegible]

In the manufacture of dredges, oil palm mills and rubber factories, production is concentrated on a small number of firms.[1] In these industries almost all producers were interviewed. The production of equipment for gravel pump tin mining is spread over a large number of firms. Some particularly important producers were identified and were interviewed separately, but most information comes from a sample survey of the industry, Industrial Machinery and Parts (code 4623)[2] and from official statistics on that industry. The extent of the identification of gravel pump mining equipment manufacture with Industry 4623 is an important question. It is discussed in Subsection 2ii and again in Section 3.

Many firms interviewed gave information on the understanding that its source should not be published and that detailed data should be used for the writer's personal understanding only. The principle adopted in this section therefore is to mention by name only large firms whose identity would in any case be apparent, and not to give any detailed information (e.g. percentages of turnover represented by particular outputs) obtained from such firms.

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[1] In the case of rubber processing, these comments apply mainly to Standard Malaysian Rubber (SMR) production. Information on small firms still producing machinery for rubber sheeting factories was obtained from the sample survey of Industry 4623 discussed below in connection with Chinese mining.

[2] Details and results of the sample survey are set out in Appendix VIII-1.

VIII - 2i Tin Dredging[1]

The making of a dredge can be divided into five categories: design, manufacture of machinery and parts, fabrication, erection, and site work. An indication of the relative importance of these items is as follows:-[2] A large dredge of say 500,000 cubic yards monthly capacity might cost $9m., of which -

design costs	$0.5m.
contract labour	$1.2 (of which erection $0.5m. and fabrication including secondary steelwork $0.75m.)
structural steel	$2.0m.
machinery and parts	$4.0m. (including at least $0.5m. for elect5ical equipment).
site costs	$0.5m.
other costs	$0.75m. (includes freight, port charges, etc.)

In addition to the $9m. quoted, another $1-2m. might be spent on site development, including the provision of staff and workers' housing, workshop, store, and construction of bunds.

Designing may be done by the mining company itself. The largest company, Anglo-Oriental, has its own dredge design department. It may be done by a manufacturing firm or by outside consultants. In fact only United Engineers, Singapore, among the local manufacturing companies,

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1 See Subsection IV - 2i for a description of some of the technical terms used in dredging which are referred to here.

2 A full account of dredge capital costs is given in Section IV - 5.

has designed dredges in Malaysia; and this not for seven years since the death of their chief designer. Most dredges are designed by overseas consultants, the most famous of whom are F.W. Payne & Co. of London. Paynes have designed nearly half of the dredges operating in Malaysia.[1] A new local firm, based in Kuala Lumpur is hoping to enter the dredge design field among a number of projects, but at the time of writing this is still in the discussion stage.

The organisation of dredge construction is done by the designer. It is rarely, if ever, that a manufacturer who did not also design the dredge is asked to build a dredge on a "turnkey basis"[2]. The designer calls for tenders for materials, the most important of which is structural steel, and for the supply of individual items of machinery as well as for fabrication and erection. Tenders are normally by private invitation, which restricts the entry of new firms into the field.

Dredge machinery and parts, other than items fabricated from structural steel such as jigs, include motors, winches, cables, and electrical equipment. These items include a wide variety of castings. Many parts are replaced a number of times during a dredge's life, generating a constant demand for spares.

Fabrication is structural steelwork - of the pontoon, superstructure, bucket ladder, and secondary structures such as chutes and jigs.[3]

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1 See Dredge Chart 1965 issued by WM Department of Mines. This is the latest available as of 1970.

2 "On a turnkey basis" means that the complete contract would be given to a single manufacturer, who would be responsible for all orders and subcontracts, and would eventually hand over the dredge completed to the client.

3 Jigs are a particularly important item, costing up to $\$\frac{1}{2}$m. and almost always made locally. Sometimes they are considered in a separate category of their own, e.g. for tendering purposes.

Before 1965 most fabrication work was done off-site, either by United Engineers or by foreign suppliers. The fabrication on site of the Selangor Dredging Company's new dredge at Dengkil in 1965 set a new pattern. Contractors now find on-site fabrication cheaper and faster. Large prefabricated items no longer need to be transported overland from workshop to site. Only certain complicated but easily transportable items are now made off-site.[1] It will be shown below that on-site fabrication has been associated with a substantial increase in the local content of dredge construction.

Parts, once fabricated, are erected stage by stage to form a complete dredge. It is usual to launch the pontoon before the superstructure or other parts are erected. Fabrication and erection takes a group of 100-120 men about two years. The labour is employed on contract for the duration of the job only. Skilled workers, about half the total labour force, are recruited in gangs:- markers, drillers, riveters, fitters, erectors, painters, and carpenters. These in turn recruit their own labourers. Skilled men are paid $10 a day, with a large bonus at the end of the contract equivalent to a daily sum of $5-10. Unskilled men earn about $5 a day with a very much smaller bonus. Fabrication and erection crews are a floating labour force, estimated by one contractor at about a thousand, who move between contractors in dredging, factory assembly, oil palm mill construction and other fields.

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[1] The prefabrication of a large part of the new Berjuntai 7 dredge by United Engineers in Singapore is an exception to this.

Site work includes site clearing excavation of the pond or "lombong" in which the dredge floats,[1] hire of cranes, and a number of minor items.

Four firms in Malaysia erect dredges. One is United Engineers, a European company. The others are Chinese firms. United Engineers (Malaysia) Sdn Bhd is the largest and oldest engineering firm in Malaysia, with manufacturing facilities in Kuala Lumpur and Ipoh, and extensive workshops in Singapore. United Engineers was established under its present name in 1912 incorporating two firms, founded 1865 and 1875 in Singapore, with interests throughout South-East Asia in ship-building, mining construction, and other civil work. Shortly afterwards a firm specializing in the manufacture of rubber processing machinery was incorporated into the group.[2] The three Chinese firms all based in Kuala Lumpur started as dredge erectors. One was in operation before the First World War, another started in 1922, and the third in 1930.

These four firms are also the only ones to fabricate dredges except for one firm formed 1964 which mainly makes oil palm machinery but also does dredge work, whose founder was for many years the paid manager of a dredge erection firm. Erection work is always a local expenditure, since it is impossible to transport a complete dredge over-

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[1] Only a lombong of minimum size for launching and initial manoevering is excavated. The dredge itself is a more efficient stripper of the overburden, and therefore can enlarge its paddock more cheaply, than any other method. Modern dredges are equipped with stripping chutes which allow material stripped by the bucket chains to bypass the treatment plant. A dredge can treat material at 35 cents a cubic yard and can strip it at a fraction of this cost. Excavation by mechanical means under contract might cost 40 cents a cubic yard.

[2] These details are from the pamphlet Progress. United Engineers Group. issued by the United Engineers Organisation (undated).

land to a launching site.[1] It is local fabrication that has accounted for a recent increase in the local content of dredge capital expenditure. United Engineers have been fabricating dredges, off-site, since at least the 1920's, although the extent of their work is difficult to determine.[2] Certainly before the Second World War many dredges were imported in a prefabricated form requiring only erection.[3] The local Chinese firms have been fabricating to a limited extent at least since the 1950's. One firm did its first fabrication job in 1956, modifying the pontoon and superstructure on a dredge. Similar conversions on other old dredges provided both extra work and fabrication experience for the erectors, until in 1964 a local erector was awarded the first complete fabrication contract on a new dredge. This was the dredge of the Selangor Dredging Company noted above as the first on-site fabrication, and also the first non-European dredging company to be formed in Malaysia. Since 1964 fabrication has been done locally, accounting for an increase of up to 10% points in the local content of the dredge. One contractor explained that until 1964 designers had not believed that local firms were

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[1] In principle erection could be done by foreign personnel specially imported for the purpose, but it was a task taken over by local firms at an early stage.

[2] The 1965 Dredge Data Chart, op.cit., lists only three dredges, the earliest is 1929, where United Engineers is the manufacturer or designer. But the AR of the FMS Mines Department in 1923 notes that two dredges were currently under construction by United Engineers, Singapore, for the FMS.

[3] In fact, as early as 1917, H.D. Griffiths, was suggesting that much dredge machinery could be made locally more cheaply than it could be imported, and that steel castings could be replaced by cheaper local iron castings. See Bucket Dredging for Tin in the Federated Malay States, op.cit., p. 28.

capable of large scale fabrication work. In fact a fund of experience had been built up not only on old dredge conversions but on fabrication of secondary items (especially jigs). It is the need for experience, it is claimed, which accounts for the lack of new firms in the erection-fabrication business except for the one firm mentioned above whose owner gained experience with an existing dredge contractor.

All four firms also make dredge parts and spares. Many of these parts are castings. Only one of the three Chinese contractors has his own (iron) foundry. The other two subcontract this work and only machine the castings bought from other firms. Steel castings are made by three firms, one of which is United Engineers, with foundries in Singapore and Ipoh. United Engineers' foundry work in Singapore dates from before 1925, and the present Kampong Bahru steel foundry was built in 1953. The Ipoh steel foundry dates from 1950. The other steel foundries, both Chinese, are in Kuala Lumpur and Ipoh and started casting steel in 1966 and 1967 respectively. Both depend heavily on dredging business, although one also does cast-iron work for Chinese mines and both cast steel for other industries including automobiles and oil palm. The demand for dredge spares is at least as important as the demand for parts for new dredges. Also, the Malayawata steel works at Prai makes a number of small structural steel components, but most steel components for dredges are larger than Malayawata can yet supply and are imported.

The local manufacture of steel castings is limited both by the capacity and accuracy of existing facilities. United Engineers, Singapore, can cast objects up to 8 tons, and 3 tons in Ipoh. The other firms can cast to 4 tons and 1 ton respectively. Accuracy of casting is a particular problem in the case of dredge buckets, which are a large item

in total costs - a bucket chain costs about $\$\frac{1}{2}$m. and must be replaced about every six years. Buckets are made of manganese steel, which is especially hard in order to withstand the heavy wear of digging. Manganese steel is difficult to machine and must therefore be cast with great accuracy as an error of even $\frac{1}{16}$" can reduce the efficiency of a bucket chain. Local steel foundries cannot cast to this accuracy. Many steel castings are imported from Australia and a branch of a large Ausgralian steel casting firm is to be established in Malaysia in 1971 with a factory in Perak making dredge parts. It is expected to produce bucket pins and half-bushes, but not buckets.[1] Local manufacturers claim that the local market is insufficient for them to make heavy engineering products at a price to compete with imports. For a number of jobs specialized machinery is required which local orders could not keep fully occupied. New entry into the steel casting business apparently is regulated by a steel committee of the Federal Industrial Development Authority, which can refuse licences to import new machinery.[2]

The pattern of engineering work for dredges is that production is mostly concentrated in the hands of a small number of firms all of which are large by Malaysian standards, although the sample survey described in Appendix VIII - 1 showed a few smaller firms producing dredge spare parts. United Engineers employ over 500 people in their Kuala Lumpur and Ipoh branches, and about 250 in their Singapore Foundry and Mechanical Engineering Divisions alone. The "average" Chinese dredge fabric-

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[1] This information is from a number of mining companies and manufacturers.

[2] This information is from a manufacturer, not from FIDA (from whom no details could be obtained).

ation-erection contractor employs upwards of 50 men in a workshop of say one or two acre, with another 100 or more on contract for fabrication and erection work on site. Turnover would be at least $2m. The capital costs of setting up such a firm are difficult to establish. One contractor quoted a figure for a hypothetical workshop of about $1.5m., using secondhand machinery purchased from overseas. Only one of the three firms is a (private) limited company, and capital appears to be raised mainly from ploughed back profits from a small beginning. The steel casting firms also are large, each with employment of over 100.

The pattern of specialization varies. United Engineers has wide interests from shipbuilding to oil palm machinery, and civil engineering. It is in no sense specialized on dredges. In contrast the Chinese dredge builders owe their beginning entirely to dredging and depend on dredging for the bulk of their business. Although they have tended to move into other structural steelwork too, dredging is always more than 50% of turnover. The steel casting firms both appear to have developed as suppliers to Chinese mines. One still has substantial Chinese mining business.

Electrical equipment for dredges, imported in its entirity before 1965, is now made locally by Tamco Electrical Engineering Co. (M) Sdn Bhd, in Petaling Jaya near Kuala Lumpur. Tamco is a joint Australian-local venture, now owned by the agency house of Harper Gilfallen. Tamco was formed principally to capture local dredging business, which accounted for most of its turnover during its first three years of operation. Now diversification into other fields has reduced the relative although not the absolute importance of dredging work. The firm's function is to buy mass produced equipment from abroad, and to custom build it to local

requirements. Of a $\$\frac{1}{2}$m. order, about $\$100,000$ would be for imported equipment. Installation would be done by a subcontractor. Tamco employs some 150 people. Foreign competition is still keen, however, and not all contracts for dredge electrics are awarded locally.

Other items made locally include magnetic ore separators for shore treatment plants, cables, some earth moving equipment, and rubber linings.

Engineering work for dredges has shown a gradual process of import substitution in response to improvements in local factor quality. Local fabrication, local casting, and local manufacture of electrical equipment have all developed in direct competition with imports and with no domestic market protection. Indeed, several of the contractors have developed an export trade in prefabricated parts, mainly to Thailand. It was shown in Section IV - 5 that about 35% of a dredge could be made locally if Malaysian firms were given orders for all items producable for existing capacity. Expansion of this proportion would involve the creation of a heavy engineering industry whose minimum market size would be larger than the dredging sector could provide. Neither oil palm nor rubber processing, it will be shown, provide a market for heavy engineering products, and processing machinery for forest-based industries is facing severe competition from Japan. Moreover, it is a widespread feeling both in engineering and mining that the current spate of dredge building is unlikely to be maintained after the next five years unless substantial ore reserves are discovered.

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[1] Current offshore prospecting offers some hope of this, but offshore mining is often done by suction dredges rather than bucket dredges, and strong Japanese competition can be expected in their supply.

VIII - 2ii Gravel Pump Tin Mining[1]

Capital equipment for a gravel pump mine can be split as follows:[2]

piping	$8,000
wiring	$10,000
construction items	$41,000
civil works	$10,000
engines and pumps	$80,000
Total	$150,000

These costs relate to a mine in the Kinta district of Perak of 20,000 cubic yards monthly capacity. The construction items (kongsi house, palong and engine sheds) and the civil items (roads, drainage and bunds) are made by local building contractors, wood being used for the constru-ction items. Demand for local engineering production consists of purchases of pumps, iron piping (about half the piping used is iron), and monitors (included in piping in the above estimates). A mine of this size would use, say, one water pump, costing $1500, and two 9" gravel pumps, one for tailings and the other for elevating ore-bearing material each costing $600-$1000.[3] These, together with piping amount to $7500.

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1 For convenience, gravel pump tin mining frequently will be referred to here as Chinese mining. Most gravel pump mines are Chinese and most Chinese miners operate gravel pump mines, although the congruity is not complete. Technical details about Chinese mining are given in Subsection IV - 2ii.

2 A more detailed breakdown of these costs, together with comparisons with other cost data is given in Section IV - 5.

3 These figures were obtained from manufacturers and are not the actual expenditure of this particular mine.

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[illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

Another estimate for a mine of similar size is that $10,000 of engineering equipment is bought locally.[1] Gravel pumps wear out in one to three years. Piping also does not have a long life. For the mine, whose costs are quoted above, the owner estimated that for a year replacement pumps and engine parts would cost $12,000. Thus replacement rather than original capital expenditure constitutes the main source of engineering demand.

Both pumps and most locally made pipes are usually of cast iron. A firm machining such equipment would embody a foundry where scrap or (more rarely) pig iron would be melted[2] and poured into sand moulds, and a machine shop where castings from the foundry would be finished. Sometimes firms will machine only, buying their castings from outside, either from foundry-machine shops or from specialist foundries.[3] Mining equipment is normally to the foundries' own design.

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[1] Tan Theong Hean, "A Study of the Sources and Nature of Credit in Chinese Tin Mining in Malaya", op.cit., p. 25.

[2] The import of pig iron, now produced locally by Malayawata, has been restricted for about two years. During this period its price has risen from $240-$280 a ton, to $300-$380 (price depending on quality). Scrap iron prices have also risen, and are now (December 1970) about $280 a ton.

[3] In fact the term "foundry" is used in Malaysia to include all foundry-machine shops, which are classified under Industry 4623, Industrial Machinery and Parts. Iron Foundries, Industry 4421, is a small industry whose value-added and employment in 1968 were equal to 11.8% and 13.1% respectively of the value-added and employment of Industry 4623, (CManI 1968). It appears that only foundries which do not machining whatsoever are included in 4421.

Casting can be done on a small scale. 27% of value-added in Industry 4421 came from firms employing less than 10 people.[1] One might expect however that there are certain economies of scale in the construction of large melting furnaces. Machining lends itself particularly to small scale production. The basic equipment consists mainly of small items such as lathes, which are duplicated in larger firms. Of course certain specialized machinery is used by large firms and often they can afford more modern basic machining equipment.[2]

Production of Chinese mining machinery is carried on by a large number of firms, often quite small, who supply mines direct. In Perak three particularly large producers, all private limited companies, were identified. In each case mining machinery was between 60% and 95% of total turnover, and employment was between 120 and 220. One also cast steel parts for dredges and oil palm mills, and the others had extended their mining services to make engine parts, to do repairs on engines and excavators, and in one case to make jigs for Chinese mines which no longer use palongs for primary treatment. One firm got 70% of its business from supplying its own tin mines, which had been bought over during the 1930's slump and tin restriction. All three firms did their own casting. One was formed in 1910, the others in 1926 and 1937. In Selangor and elsewhere no firms of this size produced Chinese mining machinery as their main product, although one very large foundry in Kuala

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[1] CManI 1968.

[2] It is a common practice for machinery in Malaysia to be bought second-hand from overseas, usually through Singapore.

Lumpur now making SMR rubber machinery formerly was an important producer. One possible reason for the lack of large firms relative to other engineering sectors is the fact that Chinese miners often demand extensive credit facilities. Many large firms interviewed maintained that they were unwilling to do business with small Chinese buyers, especially miners, for this reason. Thus as a mining machinery firm grows, it may choose to move into other fields such as dredge spares whose buyers pay more promptly.

As indicated in the introduction to this section, information on smaller firms was gathered through a sample survey[1] covering 20% of the firms in Industry 4623 in Perak and in Selangor.[2] Of a total of 24 firms in Selangor and 15 in Perak, three firms in Selangor and six in Perak produced Chinese mining machinery as their main product. They accounted for 25% and 59% respectively of the employment of all firms covered in the sample. In Selangor these firms were all in the employment range of 30-60, of medium size by Malaysian standards. For two the main product was over 75% of turnover, with repairing as the only other output. For the third, dredge spares and subcontracting work for cold storage equipment was nearly as important as the main product. Two had been formed before the Second World War and one in the 1950's.

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[1] See Table 4 in Section 3 for a summary of the survey results.

[2] The available evidence suggests that most producers of Chinese mining equipment are in Industry 4623, except for a small number of foundries, in 4421, selling unmachined castings. It is 4623 which is listed in the 1967 Industrial Classification for West Malaysia as the industry producing all mining machinery. All foundries, some ten in all, whose names were obtained from mines and other sources, were also in 4623.

Chinese mining machinery was also made as a second product (20% of turnover) by a maker of dredge spares. All four firms had their own foundry. Of the six firms in Perak, three were of medium size (30-60 workers), and the others employed 10-20 workers. All the medium and one of the smaller firms had foundries. For the medium firms the main product represented almost the whole turnover. One of the smaller firms had casting work for sawmills and rubber machinery rollers accounting for as large a partof turnover as mining machinery. Chinese mining machinery was also made by a medium sized maker of dredge parts, and accounted for 30% of turnover. The three medium firms were all founded before the Second World War. The smaller ones were all post war.

Thus it is likely that some forty to fifty firms in Perak and Selangor produce for Chinese mines.

It was shown in Section IV - 5 that about 40% of capital expenditure on a Chinese mine is local, the rest being mainly the cost of imported engines. It was reported in the Malaysian press in December 1970 that the firm of Harper-Gilfallen are soon to manufacture diesel engines locally, presumably under some form of tariff protection. Little more is known at the time of writing about this venture.

Table 1 shows the market share of domestic production of pumps, the major item of local engineering construction. It is widely contended in the tin and engineering industries that all pumps and parts are made locally.[1]

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[1] It is known that after a visit to Australia in 1968 by a delegation of Chinese miners, a new Australian gravel pump was imported and captured, some miners estimate, about 10% of the local market. It was subsequently copied by local foundries in cast iron although the locally designed pumps maintain their predominance. I am grateful to Mark Oliver, Secretary of the States of Malay Chamber of Mines, Ipoh, (interview December 1970) for bringing this to my attention.

TABLE VIII - 1 DOMESTIC MARKET SHARE OF PUMPS AND PARTS, WEST MALAYSIA, 1960-68

	(i) DOMESTIC PRODUCTION OF PUMPS AND PARTS ($000)	(ii) IMPORTS OF PUMPS AND PARTS ($000)	(iii) EXPORTS OF PUMPS AND PARTS ($000)	(iv) $\frac{i}{i + ii - iii}$
1960	2399	2048	169	56.1%
1961	...	2885	246	...
1962	3998	4043	363	52.1%
1963	3161	5527	510	38.7%
1964	3855	4803	206	51.7%
1965	4611	7584	2343	46.8%
1966	6788	8906	1151	46.7%
1967	7074	7727	1039	51.4%
1968	6746	6731	845	53.4%

Sources and Notes: 1) Imports and Exports are of Pumps Centrifugal and Rotary (MTC code 719-214) + Parts for Pumps (MTC code 719-216). Exports include re-exports.
2) Column i from SManI, FM, 1960-2, CManI, in the States of Malaya 1963, SManI, WM, 1964-67, CManI 1968.
3) Columns ii and iii from ASET 1960-68.

This contention is still possibly correct in that mine demand for pumps may be met locally - about 50% of total local demand is met by local production - while other industries import pumps of different designs. Domestic production of pumps and other mining items developed in Malaysia without tariff protection until 1969, when a 30% tariff was imposed on pumps to encourage further local production.[1]

Finally, it is worth noting that the introduction of earth moving equipment into Chinese mining has generated in the past a demand for commercial vehicles. Thus from 1960 to 1968 the number of excavators, draglines, bulldozers, etc. rose fivefold from 121 to 644.[2] However, the amount of equipment employed actually fell from 1966 to 1968,[3] while

[1] Federal Industrial Development Authority, Malaysia Industrial Digest, First Quarter, 1970, p. 6.

[2] Annual BSMI's, 1960 and 1968.

[3] Ibid., 1966 and 1968.

motor vehicle assembly only started in Malaysia in 1967. Thus the effect on local industry of this demand does not appear to have been important.[1]

VIII - 2iii Rubber

The five years to 1970 have seen major changes in rubber processing in Malaysia following the introduction of the Standard Malaysian Rubber Scheme (SMR).[2] With these changes have come changes in the organisation of the engineering sector serving the rubber industry. Most new estate factories are designed to produce SMR and conversions to SMR of factories producing sheet has proceeded rapidly.[3] In addition, factories recently built for Malayan Rubber Developments and the Federal Land Development Authority, and factories to be built for them, are mainly SMR.[4] Remillers also have been switching to SMR. Latex concentrate manufacturers have not been affected directly by the SMR scheme.[5]

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1 For a further discussion of export sector demand for transport equipment, see Section 3.

2 See Subsection V - 1v for a general discussion of the SMR scheme and of SMR processing methods.

3 One major equipment manufacturer interviewed in 1970 estimated that his firm had converted, or supplied equipment for the conversion of 70 factories previously producing RSS (Ribbed Smoked Sheet).

4 The practical alternative to SMR is the production of concentrated latex, not RSS.

5 For a description of the organisation of the rubber industry see Section V - 1.

The production of RSS equipment is of more historical than current interest. Most major engineering producers have switched from RSS to SMR.[1]

The history of Malaysian engineering is discussed further in Section 3. Here is given a brief outline of the local construction of RSS both before the SMR scheme and at present. SMR equipment, and latex concentrating factory construction, are dealt with separately.

An RSS factory consists of simple buildings, often of wooden construction, housing bulking and coagulating tanks, and a chute system leading to a sheeting battery. Attached to the factory is a smokehouse built of brick or occasionally of wood.

Neither the design nor construction of an RSS factory is complex. The basic layout has altered little for nearly forty years[2] and the

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[1] However, there is probably still some scope for production for RSS factories for estates with outputs (always expressed as the weight of Dry Rubber Content - DRC) in the 500 lb to 5,000 lbs/day range. These would be estates of 100-1,000 acres, if yields of about 1,500 lbs per year are assumed. The latest figures which relate estate acreage to the possession of processing facilities are in the 1960 Census of Agriculture, WM, Volume 16, Estates. According to Table 1359, of a total of 449 estates in the 300-1,000 acre size range 22% were without power operated sheeting or creping machinery or latex concentrating equipment. If the 100-300 acre range is added, the figure rises to 65%. Of course the construction of factories in these size groups would lower the output and machinery demand of the remilling industry, and of off-estate smokehouses and lated concentraters. 5,000 lbs/day is the minimum size quoted to me by one Rubber Research Institute of Malaya (RRIM) processing adviser for a Heveacrumb factory. 1,000 lbs/day is the minimum size for sheeting battery factory quoted in 'Budgeting for Small Estate Factories' Planters' Bulletin, November 1967 (no author given).

[2] For example, the Rubber Research Indsitute of Malaya 1932 Planting Manual, Plantation Sheet Rubber Manufacture, by R.O. Bishop, accurately describes most present-day RSS factories.

design is widely known. Factory plans can be obtained from the RRIM, and most estates would build their own factories, buying equipment as necessary. Moreover, the typical RSS factory is small which also reduces the need for outside expert help of the sort necessary for an oil palm mill or dredge.[1]

RSS factory buildings and smokehouses could be built by most ordinary building contractors using RRIM (or other) plans. The main factory cost items are the building and ocagulating system, and the sheeting battery, together with miscellaneous metal items such as smokehouse trolleys and rails.

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[1] There are few economies of scale in RSS rubber processing. The maximum size of smokehouse designed by the RRIM handles a 4,400 lbsdaily throughput beyond which capacity the RRIM recommends that an additional smokehouse be built. Coagulating tanks cannot be increased significantly in size because of the difficulty in handling vary large sheets of wet coagulum. The sheeting battery, representing perhaps 20% of the total factory cost is the only item which is normally underutilized. A battery would operate between the time latex is coagulated in the early morning and the time when the coagulating tanks are required for the current days latex brought in by the tappers at about noon. To, say, double the throughput of a factory would require a doubling of coagulating tank capacity. This would not allow the sheeting battery to be more fully utilized however, because the battery could not be used after the arrival of the day's fresh latex unless spare coagulating tanks were installed. Given the relative prices of tanks and sheeting batteries, it would be cheaper to install a second battery than to double the already doubled tank capacity. This is true for virtually any throughput, given the existing battery capacities of 1,000 lbs to 2,500 lbs/hour. Thus production facilities would normally be duplicated for larger throughputs. The economies of scale in using a single factory for larger throughputs (economies consisting of savings in factory building costs per lb. throughput, and savings in supervision costs) would be offset by the increased costs of carrying latex longer distances to the factory and of extra chemicals (anti-coagulants) to prevent premature coagulation during transit.

Most post-war RSS factories would have used coagulating and bulking tanks made of aluminium. These are made exclusively in Malaysia by Diethelm Sdn Bhd. Diethelm is a subsidiary of the Swiss firm of the same name. Originally a rubber trading company, Diethelm established estate equipment manufacturing in Singapore in 1928, and moved most of this work to Malaysia (Petaling Jaya) in 1962. Diethelm specialized in estate equipment until 1952, when the Malaysian building boom encouraged them to move into a wider range of aluminium household and engineering products. Present Malaysian employment is over 130 although estate equipment now is less than a quarter of total turnover. Other coagulating tanks are made of wood, or wood lined with aluminium. These are made on a small scale by a number of small carpentry shops, sometimes employing less than five people.

Sheeting batteries have been built in Malaysia since the early 1930's at least.[1] A sheeting battery is a simple machine selling at $8,000 to $12,000, producable by small workshops.[2] United Engineers were a major pre-war producer of sheeters. Several large agency houses had sheeters built under contract by local Chinese firms at least from the end of the Second World War, and in one case before the war (although the subcontracted firm was actually in Singapore).

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[1] B.J. Eaton, "The Preparation of Raw Rubber: Recent Advances in Estate Factory Practice", Malayan Agricultural Journal, May 1932, notes the appearance of a new high capacity battery made by a local engineering firm.

[2] One such producer in Malacca, whose product is sometimes recommended by the RRIM, employed only 10 people, although he bought castings from another firm.

Another agency house imported sheeting batteries of its own design from a U.K. licencee until 1952 when local competition forced it to set up its own manufacturing facilities. An indication of the market share of local production before the introduction of the SMR scheme is given in Table 2. This table underestimates local production since at least two major producers are not classified under Industry 4623. The decline in imports of sheeters, unaccompanied by any definitely rising trend in domestic production, illustrates the declining importance of RSS in new factory construction.

Domestic production of smallholders' rubber equipment - coagulating pans and mangles, housed in simple buildings or sheds - was not investigated nor are there statistics available other than those in Table 2. Firms interviewed suggested that although mangles were made locally before the Second World War, much of the local market has been lost to imports from Mainland China.[1] This cannot be investigated statistically since the Surveys and Censuses of Manufacturing do not break down the category "estate machinery" in any way. Diethelm has recently produced an aluminium "mini-coagulating tank" for use by smallholders to replace the coagulating pans.

All of the large European firms - United Engineers and at least three agency houses - who made RSS machinery are now active in the SMR field and have virtually ceased RSS production. They have been joined by a major new entrant, GEC-AEI(M) Sdn Bhd, the international manufacturer of electrical equipment, and the specialist design firm of Promoci Engineering Sdn Bhd. Promoci is a French company, a subsidiary

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[1] In 1968 36% of imported mangles were from China, and most of the rest from Singapore (ASET 1968).

of a French planting company in Indo-China, which has pioneered new processing methods in Vietnam, Cambodia, and the Ivory Coast. GEC, already established in Malaysia before the SMR scheme, originally became interested in rubber processing in trying to find an outlet for a fan produced by a U.K. subsidiary. This led to the development of an airdrying tunnel for rubber sheet. Their emergence as a major producer dates from the SMR scheme however when they were used by the RRIM to make its experimental Heveacrumb equipment.

Promoci works in association with United Engineers who provide the manufacturing facilities. G.E.C. and one agency house subcontract to local firms, while another agency house has its own manufacturing facilities, and the third itself works as a subcontractor. Thus the main role of the European companies except for United Engineers is design and the organisation of production. The RRIM has also played an important part in design, although its own process, Heveacrumb, has been superceeded by the use of comminution methods. The SMR scheme has brought about an increase both in the size and the complexity of rubber processing factories. While a typical RSS factory might be of 1 ton/day capacity, an SMR factory, according to one manufacturer is usually of a 10 ton/day size, and factories of 40 and 60 tons/day, and larger are planned.[1] This increase in factory size and complexity has

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[1] No figures are available on the size distribution of either RSS or SMR factories. According to two authorities on the rubber industry, the largest RSS factory ten years ago was 8 tons/day, and very few approached half that size. See. J.E. Morris and D.J. Graham, "The Heveacrumb Process", Natural Rubber Conference, Kuala Lumpur, 1968, preprint, p. 5. SMR production involves the useof more expensive, indivisible pieces of equipment than does RSS, making it more suitable for large scale production.

TABLE VIII - 2 DOMESTIC MARKET SHARE OF RUBBER ESTATE MACHINERY, WEST MALAYSIA, 1960-68

($000)	(i) DOMESTIC PRODUCTION OF ESTATE MACHINERY	(ii) IMPORTS OF MANGLES	(iii) IMPORTS OF SHEETING BATTERIES	(iv) EXPORTS OF MANGLES	(v) EXPORTS OF SHEETING BATTERIES	(vi) DOMESTIC PRODUCTION + IMPORTS - EXPORTS (i + ii + iii - iv - v)	(vii) MARKET SHARE OF DOMESTIC PRODUCTION $\frac{(i)}{(vi)}$
1960	...	566	713	130	167	...	...
61	...	444	725	37	89	...	...
62	333	445	246	13	612	399	83.5%
63	553	499	150	27	61	1144	49.6%
64	737	523	183	26	83	1334	55.2%
65	428	814	140	36	136	1210	35.4%
66	173	912	200	35	132	1118	15.5%
67	531	628	135	18	63	1213	43.8%
68	553	618	24	32	128	1035	53.4%

Sources and Notes: 1) Column i from SManI, WM, 1960-62, 1964-67 and 1968 CManI, WM. Columns ii, iii, iv, v from ASET 1960-68.
2) Exports include re-exports.
3) Estate machinery output is that of Industry 4623, Industrial Machinery and Parts. Mangles are Rubber Mangles Hand Operated (MTC code 719-611). Sheeting Batteries are Rubber Sheeting Batteries (MTC code 719-612).

given "turnkey" rubber factories a place in the industry which they did not have with RSS. However, it is worth remembering that in terms of acreage served, an SMR factory is still a much smaller investment than an oil palm mill.[1] Even with SMR, some estates arrange their own factory construction (or conversion), buying individual pieces of equipment as required.

As in dredging and palm oil, local non-European firms play an important part in SMR rubber machinery manufacture. In contrast to dredge and oil palm mill construction, however, the growth of local production of SMR equipment has not taken the form of an integration of structural steel firms backwards into machinery fabrication. As with RSS, SMR equipment involves much casting and machining and the firms now making SMR machinery are mainly machine shops who learnt their business with RSS. Such firms may either do their own casting as well as machining, or specialize entirely in machining. Most do little structural work. Although factory buildings may be erected by a machinery manufacturer the work could be given to any structural steel firm. In fact some SMR factories are of wooden construction, the manufacturers feeling that this reduces costs.

At least three non-European firms, all in Kuala Lumpur, make the various types of SMR coagulum size reduction machinery under subcontract. These include one of the largest machine shops in Kuala Lumpur, employing over 130 people and founded in the early 1920s, which previously produced both RSS and mining equipment. The other two were

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[1] Compare Table V - 39 for rubber with Appendix VIII - 2 Table 1 for oil palm.

founded soon after the Second World War, although one has only recently moved its rubber manufacturing facilities from Singapore to Malaysia. These firms are in the 35-60 employee size, although one employs extra men on contract for factory erection. Both the latter firms have always depended heavily on rubber. SMR machinery is typically over 70% of turnover. SMR machinery is also made on a small scale by one Chinese oil palm machinery producer. For United Engineers, the other main producer, rubber equipment is only a small part of turnover. One agency house's manufacturing facilities, a workshop with some 25 employees, are subcontracted to a European manufacturer. The extent of independent local production (i.e., not organized under subcontract) was difficult to determine. The sample survey of Industry 4623 revealed no firm making SMR machinery independently. At least one Chinese firm in Kuala Lumpur makes SMR machinery independently, as does a manufacturer in Singapore. This production is likely to increase in the future as SMR designs become more widely known (and copied). Several oil palm mill contractors expressed an interest in entering the SMR field, and one has already done so.

The type of firm making coagulation equipment varies with the particular SMR process in question. The Promoci Decan process coagulates in mild-steel drums, made by United Engineers. GEC uses a block coagulation system requiring large concrete tanks which could be installed presumably by an ordinary building contractor. Many estates still use aluminium tanks, and larger types have been experimented with, but it is likely that the scope for aluminium products is much less under SMR than RSS.

Driers are made by one of GEC's subcontractors, by United Engineers, and by an independent firm Industrial Driers Sdn Bhd. which produces the "Unidrier". Driers are also within the scope of independent local firms making other SMR machinery. Baling presses are made by Malayan Development Machinery Sdn Bhd.

The local manufacture of latex concentrating equipment was not investigated separately, although some information was collected during studies of oil palm and rubber machinery production. One factory visited in 1969 built in 1965 provided a set of capital cost data. For a 20 ton/day DRC throughput, total costs were $1.25 of which

buildings	31.6%
vehicles	16.1%
equipment	52.3%

Certain similarities with an oil palm mill are suggested by these data. The buildings (made of structural steel) are more expensive in absolute terms than for SMR factories of the same throughput.[1] This implies that the structural steelwork for "buildings" includes work on machinery platforms and other secondary items. Two oil palm construction firms interviewed had been building latex concentrating factories before they had started oil palm work. The equipment in contrast appears mainly to be imported. The factory, whose costs are shown in fact imported 98% of its equipment. No firm interviewed during the study produced separators, the main item of equipment, which account for about 70% of

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[1] See Section V - 4. Only in the case of SMR factories designed for eventual expansion to much larger capacities do building costs, including site preparation, approach this level.

equipment costs. Nor are generators, the other main item, produced locally. Vehicles could be obtained within Malaysia, although the indirect import content is very high.

A discussion of the possibilities for expansion of the local content of rubber processing machinery is less relevant than for dredging or oil palm. As was shown in Section V - 4, over 60% of an SMR factory can be made locally. Extension of this percentage to 70% is largely a matter of local manufacturers competing with imports for the supply of items producable for existing local capacity. Passing the 70% mark would require local production of electrical, hydraulic and other equipment not at present contemplated.

As with tin and oil palm, the local manufacture of rubber processing machinery has developed largely without tariffs or other external protection. Local industry has been able to produce items in specialized demand by the rubber industry while continuing to import the small amount of more sophisticated general engineering products for which the Malaysian economy does not generate a sufficient demand for local production.

VIII - 2iv <u>Oil Palm</u>

One authoritative work divides mill construction into seven categories, as follows, for a mill processing 40 tons of fresh fruit bunches an hour.[1]

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[1] I.W. Cooper and J.W.L. Bevan, "Some Factors to be Considered when Planning the Organization of Processing Oil Palm Products," Oil Palm Developments in Malaysia, op.cit., p. 128. The mill figures exclude kernel processing, which helps to account for the rather low total cost in comparison to costs quoted in Appendix VIII - 2.

[illegible]

1. Site preparation	\$0.140m.
2. Mill buildings	\$0.615m.(including \$0.175m. for staff quarters)
3. Equipment (including office, laboratory, drawing office, workshop and factory)	\$0.080m.
4. Labour requirements during construction (opening crates and cleaning equipment)	\$0.035m.
5. Machinery and Installation	\$2,852m.
6. Electrical equipment	\$0.120m.
7. Foundations	\$0.100m.
8. Supervision during construction, (including preparation of drawings)	\$0.200m.
TOTAL	\$4.142m.

Mill buildings excluding staff quarters, are normally made from structural steel. Foundations are for machinery. The small importance of buildings in total costs relative to the mill and superstructure on a dredge and the larger relative importance of machinery lessens the scope for primary steelwork erection. Erection is less important therefore as a separate category.

Many mills in Malaysia are built on a turnkey basis. Three firms at present will undertake this: United Engineers in association with Gebruder Stork en Co. of Holland, Speichim Malaysia Sdn Bhd, and National Construction Co. Sdn Bhd. Tow other firms, one British and one German, are said also to be trying to break into the market. Stork

and Speichim are foreign manufacturers and designers of oil palm machinery who have moved part of their operations to Malaysia. Stork is a pioneer in the field, and has been supplying oil palm machinery and complete factories since long before the Second World War. Speichim, the Société pour l'Equipment des Industries Chimiques, of Paris, is a chemical engineering firm which entered oil palm in 1966 with the construction of mills in the Ivory Coast and other parts of Africa. Speichim established itself in Malaysia in January 1970. National Construction is a civil engineering firm, with no overseas manufacturing facilities for oil palm. It was formed in 1962 as a joint venture between a building firm from Australia and a local Malay contractor. NCC does not have its own design facilities but uses one of the three local design consultants, about whom more later.

An alternative arrangement to turnkey projects is for an estate company to have a foreign designing-manufacturing firm such as Stork or de Wecker, design a mill. It will be agreed with, say, Stork what will be purchased from Stork and bought locally from other firms. Often the company will arrange for its own installation. This pattern has been important in the past and still continues.

Stork and Speichim, although they retain manufacturing facilities abroad, have not themselves set up local manufacturing of their own but, like NCC, subcontract this work to smaller local firms. Thus there is an important "second tier" of firms all Chinese except United Engineers, who make pàlm oil machinery. The association of Stork with United Engineers dates from 1967, replacing a subcontracting arrangement with a Chinese firm. Except for United Engineers, members of this second tier would argue that they have neither the technical

expertise (for design) nor the financial strength to construct mills entirely on their own resources. United Engineers presumably is capable of doing this - it designed dredges for example - but has preferred an arrangement with Stork.

There are also in Malaysia three consultants who design mills. Two are employed as processing experts by large estate groups, and the third has his own private company. This is a development which has taken place during the three years to 1970. A consultant would arrange for the local supply of machinery and presumably for such imported equipment as was necessary.

Seven Chinese firms, all in the Kuala Lumpur-Port Sweetenham area, and United Engineers, comprise the second tier. United Engineers has already been described in the dredging section. Oil palm work is almost certainly a dominant part of their turnover.[1] For the Chinese firms with one exception oil palm is half or more of total turnover. All of them do other structural steel work, and one fabricates dredge equipment. For only two is rubber machinery significant (about 10% of turnover or more). Employment per firm varies from 60 to 150 workers employed directly and another 60 to 300 employed temporarily on contract for outstation erection and construction work. Turnover per firm varies from $1m. to $5m. a year. Four firms work as subcontractors for the larger European suppliers. Two do jobbing work direct for estates, and one works mainly for a design consultant. However, the subcontracting relationship appears to be a fluid one which does not prevent a firm taking other business.

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[1] One competitor estimated that they had 30% of the total Malaysian oil palm mill business.

None of the second tier firms directly owes its existence to oil palm. Manufacture of oil palm machinery dates from about 1950. This early business was mainly repairing and making spare parts. By 1960 two of the present firms felt oil palm was a dominant part of their business but all agreed that the boom in mill construction, and with it the boom in their own business, started in 1967-8. This is true even of United Engineers. The founding of all of them antedates this boom.[1] Two were formed before the First World War, one making rubber machinery and the other doing estate construction work like smokehouses and labour lines. Estate construction work was also the early business of a third firm founded in about 1920. Three more were founded in the period 1948-54 and the last in 1964, its founder having previously been manager for many years for a dredge erection contractor. 1948-54 includes the post Korean building boom in Malaysia which saw the introduction on a large scale of structural steel for building construction. Previously many estate and factory buildings had been made of wood. All but two firms who made rubber machinery, and already were doing oil palm work, were important structural steel contractors by the mid-1960's, before the mill construction boom. Mill buildings construction is little different from other steel construction. What is significant is that most palm oil machinery except for certain sophisticated imported items, is structural steel fabrication. As one manufacturer put it, it was logical to move backwards from making mill building to the fabrication of machinery.. Few new skills were required once designs were available.

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[1] One was formed as a separate concern to make oil palm machinery in 1967, but its parent company had been in business for some 50 years, and the distinction between them was purely legal.

Thus at present items such as threshers, tanks, sterilizers, conveyors, and silos can be made in Malaysia. In contrast to the heavy engineering of dredge manufacture, oil palm work is light. Some light castings are required, e.g. wheels for fruit cages, and these are made by local steel foundries, already described in the dredging section.

As is shown in Appendix VIII - 2 about 50% of an oil palm mill is typically made locally. The imported items include presses, digesters, boilers, steam engines, and hydraulics. These are sophisticated items which Malaysian industry does not foresee making for a long time to come.[1] Those five items alone would come to over $2m. on a $6m. mill. Presses, digesters, and boilers alone amount to well over $1m. These impose limits to maximum local content. Probably the greatest local content has been achieved by the use of design consultants. The first mill to be designed by a consultant reduced total cost from a typical $6m. to $4.5m. of which he claimed only $1.5m. was imported. Part of the fall in total costs is the direct result of the increase in local content. Part also is due to the bypassing of the large designing and manufacturing

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[1] It is worth noting in this context that oil palm machinery is but a small part of the business of firms like Stork and Speichim. Speichim, as already noted, is primarily a chemical engineering firm. Stork is part of the huge Dutch engineering combine VMF/Stork-Wilton NV. This combine, employing 25,000 workers in 1968, makes complete plants and individual items of machinery for more than twenty industries, including petrochemicals, sugar refining and the dairy industry. Presumably many production facilities used in the manufacture of oil palm mills are common to the manufacture of other products made by the group. Production of this sort is geared to the markets of major manufacturing countries, and the possibility of relocation to an underdeveloped country is therefore limited. (Information on Stork from Netherlands Government Information Service, Capital Goods from Holland (The Hague, 1968) pp. 150 and 162. I am grateful to the Export Intelligence Library of the Board of Trade, London, for bringing this publication to my attention).

companies whose profits is thereby eliminated.[1]

As with tin and rubber processing, the local manufacture of oil palm machinery has developed without the aid of tariff protection and largely without direct government assistance. It is widely felt that companies such as Stork and Speichim were forced to set up in Malaysia since they could not otherwise compete effectively with local industry.

VIII - 2v Historical and Regional Aspects of Engineering Production for Export Industries, Technological Externalities, and the Pattern of Specialization

This subsection attempts to draw together some general elements in the relations between engineering production for the various export sectors.

The oldest form of non-European local engineering is the manufacture of Chinese mining machinery. Of firms now in existence, over half of the total number, with about three quarters of total production, were formed before the Second World War. Several were formed before the First World War. The regional concentration of this production is in Perak and Selangor, which states produce nearly 90% of Chinese mining output.[2] The greater concentration in Perak is not surprising since Perak's gravel pump tin output is over twice that of Selangor.[3] Chinese

[1] The long term effect of this bypassing is disputable. Certainly costs are reduced, but at least some people in the industry feel that technical progress in mill design may be retarded since consultants cannot finance the research and development expenditure which large companies might be expected to carry out.

[2] Quarterly BSMI, June 1970.

[3] Ibid.

mining machinery manufacture involves iron casting and simple machining. Rubber sheeting and creping machinery also requires casting, with more complicated assembly and machining. Hence the development of rubber machinery making can be based on techniques acquired in making Chinese mining machinery. In fact, few Chinese mining engineering firms today make the older types of rubber machinery, although a number cast rollers and other simple items. Most rubber machinery is made by specialist firms, most of whom grew up after the Second World War. Before the war United Engineers and at least one other non-European manufacturer in Singapore, made rubber machinery, and many local firms did repairs and odd jobs for rubber estates. However, it is possible, indeed likely, that many local rubber machinery firms were started by men who had learnt their trade in mining workshops (or in United Engineers). Almost all Chinese engineering firms are set up in this way, and the new proprietor often can expect orders from his former employer, who knows the quality of work he can expect. The making of dredge spares, on the other hand, is work frequently done by some larger Chinese foundries. One of the Chinese steel casters still retains gravel pump machinery as the mainstay of the business.

Experience in the older forms of rubber machinery has been the basis for the start of SMR machinery making. The only new entrant to the field, without this experience, has been GEC, which subcontracts its manufacturing.

Dredge erection and oil palm mill construction have followed quite different paths of development from the machine shops. In both cases erection contractors have moved into fabrication of parts. Fabrication for mills and dredges is work of a different type from casting and

machining, although both types do use many castings too. What is surprising is the lack of cross-fertilization between the two fields. Only in two cases were they found to be linked. In one case the paid manager of a dredge erection firm left to set up his own structural steel construction firm, developing both a business in dredge parts and in oil palm mills. In another case a structural firm making mills also received a recent order for dredge pontoon fabrication. Oil palm mill construction firms are mainly a product of the boom in structural steel building in the early 1950's. Firms having learnt their trade at that time, later moved into oil palm mill building. Dredge erectors have remained specialized, but with some tendency to develop new activities in general factory building, but never oil palm. While the dredge erectors owe their existance to dredging, oil palm erectors often do their oil palm work as only a small proportion of their structural work.

European firms in export industry engineering, have been of three sorts. First, United Engineers, who are in a category of their own, and who have been a major producer of dredging, rubber and oil palm equipment. Second, there has been development of manufacturing activity as part of general diversification by agency houses such as Guthries, Harrison and Crossfields and Sime Derby, and similar diversification by international firms already established in Malaysia such as GEC. Third, specialized foreign engineering firms like Stork and Speichim, have moved into Malaysia. European firms have played an important role in the development of local non-European firms in the field by providing designs while frequently subcontracting the actual manufacture.

A striking feature of oil palm, rubber and dredge erection firms is their concentration in the Kuala Lumpur-Klang industrial complex in

Selangor. No firm was found in Perak which erected dredges or mills, or which made SMR rubber. Proximity to buyers' head offices in Kuala Lumpur was the most common reason given by firms for Kuala Lumpur's supremacy. Several firms in Perak related how they had tried unsuccessfully to break into the SMR field.[1] In the case of dredge erection this may also be historical accident since, because of the high degree of expertise and expansion required, new firms find it difficult to enter the field whatever their goegraphical location.

Engineering firms have played an important role in the provision of skilled workers. Most firms interviewed, and all the larger ones, had an apprenticeship system. Typically, some 30% of employees would be apprentices who would start at age eighteen at $2 a day, rising to $4 to $6 as assistant mechanics (etc) after one or two years, and eventually to $8 or more as skilled workers after another three to five years. As was mentioned above, it is a well established tradition that skilled workers may leave to set up their own firms. Usually they will start on a small scale gradually buying more machinery from retained profits.[2] Often a firm's first orders will be subcontracted work from the proprietor's former employer, until the new firm builds up direct contracts of its own with buyers. The system of subcontracting is facilitated by the close proximity of engineering workshops. Most firms in Kuala Lumpur are in the Sungei Besi/Chan Lin Roads complex on the South-West of the city, and in Ipoh most foundries are on the Lahat Road continuing out of town to the suburbs of Menglembu and Pusing.

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1 These remarks apply equally to the making of sawmilling machinery, also a Kuala Lumpur preserve.

2 The highly divisible nature of light engineering machinery lends itself to this process. Although a number of the larger Chinese firms have adopted limited liability, they are all private companies which are mainly family concerns, all shareholders normally being related. Thus the non-European sector of industry is almost entirely internally financed.

Section VIII - 3 Engineering in the Malaysian Economy

In the industries covered by the Surveys and Censuses of Manufacturing Industries[1] four Major Groups can be identified as engineering producers. Each Major Group is divided into a number of Industries, according to the Malaysia Industrial Classification of 1967. In addition there are the Non-Residential and Engineering[2] Construction Industries, covered in the Surveys of Construction Industries, West Malaysia.

To determine where engineering production for the export sector was located within these groups two methods were used. First, industries manufacturing the various engineering inputs used in rubber, tin, and oil palm were sought in the alphabetical index of the 1967 Malaysia Industrial Classification, which provides a classification by industry of industrial products. Mining Machinery Manufacturing, Dredge Manufacturing, Dredge Part Manufacturing were all in Industry 4620, Industrial Machinery and Parts.[3] Second, the industrial classification of producers

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1 These date from 1959, when the first Census was published. Censuses were also taken for 1963 and 1968, with Surveys in the intervening years. 1968 is the latest available year at the time of writing (January 1971). The Censuses and Surveys are the main sources of official data for this section. The 1965 input-output table is of virtually no use. No local purchases of Metal Products and Machinery or Basic Metals are listed for mining, even though this study has shown that there is a substantial mining demand for replacement pump parts and other castings (see Table IV - 14). Investment purchases in the input-output table are not disaggregated in any way.

2 In fact only one of the engineering producers (Speichim) discussed in the previous section is listed under Engineering Construction. Engineering Construction figures are given in Table 6, for interest, but the industry is otherwise ignored.

3 Although this is the code number given to Industrial Machinery and Parts in the Classification and in the index to the Census, it is always referred to as 4623 in the body of the Census and Survey reports. It is not clear whether this is a purely clerical discrepancy or whether the industry has been redefined slightly without altering its name. Hereinafter it is referred to as 4623.

whose names were collected during work for Section 2 was checked.[1] All such producers of gravel pump mining equipment were classified under 4623, as were two of the three Chinese dredge builders. (The third was in Industry 4510, Manufacture of Fabricated Structural Shapes). Most non-European producers of rubber processing machinery also were in 4623, as was also one of the two non-European steel casters (the other was in 4510). Although most producers of rubber and tin mining machinery were in 4623, some were found elsewhere in the 46 group. 4610, Manufacture of Agricultural Machinery and Implements, includes a major producer of rubber machinery, as does 4659 Manufacture of Refridgerating, Exhaust, Ventilating and Air Conditioning Equipment. Another rubber machinery producer is classified (erroneously)[2] under 4630, General Engineering and Repair Shops. Also, one would expect that at least some 4630's output may include repairs for mines and estates. The production of oil palm mills and machinery lies outside the 46 group, and is dealt with below.

The importance of production for engineering industries <u>within</u> 4623, the largest industry in the 46 group, is shown in Table 3. Outputs identifiable as being for the export sector constitute 36% of output, if saw milling equipment is included. This is the minimum dependence on

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[1] I am grateful to the Department of Statistics, Kuala Lumpur, for providing this information.

[2] An erroneous classification is one where a firm's main product falls outside the scope of the industry in which it is included. This case should be distinguished from that of large multiproduct firms like GEC (in Industry 4659) whose classification presents a genuine dilemma with regard to subsidiary outputs.

TABLE VIII - 3 SALES OF INDUSTRIAL MACHINERY AND PARTS, (INDUSTRY 4623) 1968

	($000)
Pumps	2,477
Pump Parts and Spares	4,299
Mining Machinery	1,384
Estate Machinery	553
Liners	971
Runners	707
Liner and Runner Doors	2,246
Bandsaws	420
Monitors	106
Total of above items	13,163
Total of sales of 4623	34,939

Sources and Notes: 1) CManI, 1968.

the export sector. Many other products listed, such as other machine parts ($5.4m.), Other Products ($4.1m.) and Income from Services ($8.9m.) will contain elements of export industry inputs. The dependence on the export sector is more clearly shown by the sample survey undertaken of Industry 4623 in Perak and Selangor.[1] Table 4 presents survey results showing that in Selangor and Perak 80.6% and 76.7% of employment, respectively, was in firms whose main product was for the export sector. In both states at least half of employment in the Repairs and Odd Job categories was in firms doing a substantial part of their business with mines or estates.

No entry for oil palm machinery was found in the Industrial Classification. United Engineers (Kuala Lumpur) and one major oil palm contractor are listed under 4510, Fabricated Structural Shapes, together with the third Chinese dredge-builder and a large manufacturer

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[1] See Appendix VIII - 1 for fuller details of the survey, undertaken mainly to provide data to supplement the official statistics. Perak and Selangor together accounted for 82.1% of value-added in 4623 and 82.3% of full-time employment in 1968.

TABLE VIII - 4 SALES OF INDUSTRIAL MACHINERY AND PARTS (INDUSTRY 4623) - SAMPLE SURVEY, PERAK AND SELANGOR, NOVEMBER-DECEMBER 1970

	NUMBER OF FIRMS	EMPLOYMENT	EMPLOYMENT AS PERCENTAGE OF TOTAL SAMPLE EMPLOYMENT
Selangor			
Dredge Erection and Fabrication	1	140	25.9%
Gravel Pump Tin Mining Equipment	3	135	25.0%
Sawmilling Machinery	3	76	14.0%
SMR Rubber Machinery	1	35	6.5%
Structural Steelwork (including Oil Palm Mill Construction)	1	30	5.5%
Dredge Parts	1	20	3.7%
Other Manufacturing (Precision Tools)	1	10	1.8%
Repairs and Odd Jobs	13	95	17.6%
Perak			
Gravel Pump Tin Mining Equipment	6	198	59.3%
Structural Steelwork (excluding Mill Construction)	1	34	10.2%
Dredge Parts	1	30	9.0%
Rubber Creping Machinery	1	28	8.4%
Repairs and Odd Jobs	6	44	13.2%

Sources and Notes: 1) Appendix VIII - 1.

of steel castings. The permanent employment[1] in these four firms in 1970 was nearly 700, which is over half the total employment in Industry 4510 in 1968 (the latest year available). All but one of the other oil palm mill contractors[2] are listed under Industry 5112, Non-Residential Construction, data on which are available from the SCI. The permanent employment in the six contractors in 5112 in 1970 was equal to only 5% of 5112's 1968 employment, though the addition of contract workers might raise this by another 5 to 10% points.

1 The number of workers employed by individual firms for on-site construction varies considerably over time. Moreover, since such contract workers tend to move between firms according to the work available, aggregating the contract employment of all firms would involve double counting.

2 The exception is Speichim, classified under Engineering Construction (Industry 5120). Speichim has no manufacturing facilities of its own, and subcontracts to firms in Industry 5112.

Export sector production is less important in group 45 than in 46. The size of industries 4623 and 4510 in relation to their major groups can be seen in Table 6. Some export sector production is found in other 45 industries. Diethelm, the manufacturer of aluminium equipment for estates is in 4563,[1] and accounts for 12% of that industry's employment. Another industry is Tinsmithing (4562) whose main customer is the rubber estate sector and whose value-added in 1968 was 5% of that of the 45 group.

Within group 47 production for the export sector is small. Tamco, the producer of dredge electrical equipment had a 1969 turnover of $3m.[2] equivalent to 6% of the group's gross sales in 1968. Manufacture of cables, used by dredges in particular, is also included in 46.

Table 5 shows demands for motor vehicles from the export sector relative to the output of Industry 4832, Manufacture of Motor Vehicles and Parts, and of the 48 group. If oil palm estate demand is assumed crudely to be at most the same as for rubber, acreage being much smaller but vehicle use being higher (for harvesting and fruit transport), total demand from the export sector is about 20% of vehicle output. This is a large potential demand and may have influenced the motor vehicle assembly investment decision, although it is not dominant in the way that export sector production is for Industrial Machinery and Parts for example.

Including the outputs of Industries 4623 and 4510, together with estate aluminium products, tin smithing, motor vehicles for estates and mines, and assuming that part of output in other 46 group industries is

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[1] Manufacture of Brass, Copper, Pewter, and Aluminium Products.

[2] MID, 2nd Quarter, 1970, p. 9.

TABLE VIII - 5 DEMAND FOR TRANSPORT EQUIPMENT BY TIN MINES AND RUBBER ESTATES, 1968

	PURCHASES OF NEW TRANSPORT EQUIPMENT ($000)	PURCHASES AS PERCENTAGE OF INDUSTRY 4832 OUTPUT
Tin Dredging	93	0.1%
Other Tin Mining	2,398	3.6%
Rubber Estates	4,644	7.0%
Output of Industry 4832, Manufacture of Motor Vehicles and Parts	66,588	
Output of Group 48, Manufacture of Transport Equipment	82,262	

Sources and Notes: 1) Tin statistics from CMinI, 1968; rubber from RSH, 1968, vehicle output statistics from CManI, 1968.
2) From the CManI figure for rubber estates ($5.197m.) has been subtracted $0.553 (value of estate machinery output of Industry 4623), since RSH statistics included purchases of machinery with transport equipment. Since neither imports nor purchases of rubber machinery from other industries are subtracted, the rubber transport demand given above is certainly overestimated.

export sector orientated, production in firms producing mainly for the export sector constitutes about one third of engineering output in 1968 and 1963. Table 6 shows that the growth rates of 45 and 46, and of 4510 and 4623, have been below that of all covered industries, while engineering as a whole has kept pace with all covered industries because of the rapid growth of electrical engineering and transport equipment. The relative position of groups 45 and 46 in 1959 is less easy to determine, because the increase in Census of Manufacturing coverage in 1962-3 greatly increased the scope of the 46 group. What is clear is that over the 1959-62 period both groups were growing faster than overall engineering output, which in turn was growing faster than manufacturing output as a whole Manufacturing activity itself grew at nearly three times the rate of GDP, 1959-62, and over twice as fast in 1963-68. Using the retail price index as an indicator of domestic price changes, these output increases can be seen to have been almost entirely in real terms.

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TABLE VIII - 6 GROWTH RATES OF ENGINEERING AND MANUFACTURING OUTPUTS, AND GROSS DOMESTIC PRODUCT, WEST MALAYSIA, 1959-68

	VALUE ADDED ($000, AT CURRENT PRICES)				AVERAGE ANNUAL GROWTH RATES	
	1968	1963	1962	1959	1963-68	1959-62
Metal Products (Major Group 45)	38,987	22,735	10,040	6,189	11.4%	17.5%
Machinery except Electrical (Major Group 46)	25,158	14,747	5,193	2,799	11.3%	20.0%
Electrical Machinery (Major Group 47)	20,781	4,702	...	...	32.9%	...
Transport Equipment (Major Group 48)	18,724	5,973	3,638	2,552	25.7%	12.6%
Industrial Machinery and Parts (Industry 4623)	15,420	9,253	5,193	2,799	10.8%	20.0%
Fabricated Structural Shapes (Industry 4510)	5,854	3,467	...	...	11.0%	...
All Engineering Industries (Major Groups 45-48)	103,650	48,147	18,871 (Groups 45,46,48)	11,540	16.6%	17.9%
All Covered Industries	873,851	420,339	248,409	166,680	15.7%	14.2%
Engineering Construction (Industry 5120)	73,859	58,755	...	...	4.7%	...
Non-Residential Construction (Industry 5112)	33,461	39,908	...	...	-1.1%	...
West Malaysian GDP at Factor Cost Current Prices	$7180m. (1966)	$5862m.	$5496m.	$4760m.	6.9% (1963-66)	4.9%
Retail Price Index (1959 = 100)	108.2	102.8	99.7	100.0	1.0%	-0.1%

Sources and Notes: 1) Value-added figures from CManI, 1968, and CManI, 1963, and SCI 1968 and 1963. (SCI first published in 1963). Construction industries are not covered in the CManI. Retail Price Indices from MBS, June 1970. 1959 GDP figure from *Interim Review of Development in Malaya under the Second Five Year Plan, 1963*. 1963 and 1966 figures from *National Accounts of West Malaysia 1960-66*. 1966 is the latest national accounts figure for West Malaysia published at time or writing (January, 1971).
2) Growth rates calculated as average annual compound rates.
3) 1962 and 1963 output statistics are not comparable, because of a major extension in CManI coverage in 1962-3. Under the pre-1963 classification Industry 4623 was the only industry covered in Group 46.

Retail prices fell from 1959 to 1962, and rose very slowly from 1963 to 1968.

Census and Survey of Manufacturing and Survey of Construction coverage is less than complete. Thus in 1963 the ratio of Manufacturing

TABLE VIII-7 SHARES OF ENGINEERING, CONSTRUCTION, AND MANUFACTURING IN GROSS DOMESTIC PRODUCT, WEST MALAYSIA, 1960-66

	1960	1961	1962	1963	1964	1965	1966
Gross Domestic Product ($m.)	5197	5268	5496	5862	6255	6844	7180
Manufacturing as % of GDP	8.7	8.1	8.6	9.1	9.8	10.2	10.9
Metal Products, Machinery, etc., as % of Manufacturing (in CManI)	8.4	10.7	12.5	12.4	11.3	11.3	10.7
Construction as % of GDP	3.0	3.6	4.3	4.7	4.6	4.6	4.5
Non-Residential Construction as % of Total Construction (in SCI)	...	...	...	22.7	22.8	23.5	15.4

Sources and Notes: 1) From National Accounts of West Malaysia 1960-66.
2) GDP figures are at current prices, at factor cost.
3) Percentages of Non-Residential Construction in Total Construction and Metal Products etc., in Total Manufacturing are from SCI 1963-66 and CManI 1960-66, respectively.

output as listed in the national accounts[1] to that of the Census was 1.27, and 1.56 for Construction. It had been 2.15 in 1960 for Manufacturing, before the increase in Census coverage. Table 7 shows the shares of Metal Products and Machinery, etc. in Manufacturing and of Non-Residential Construction in total Construction, and Manufacturing and Construction in GDP, for 1960-1966. Metal Products and Machinery etc., include electrical engineering and transport equipment. It is interesting to note also that as far back as 1947, engineering output was 11.8% of manufacturing output for Malaya and Singapore, with almost exactly equal production in the two regions.[2] Of course, the 1947 figures are not strictly comparable with later data, but they do

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[1] National Accounts of West Malaysia 1960-66.

[2] See F. Benham, The National Income of Malaya 1947-9 (with a note on 1950) (Singapore 1951) Benham's figures are for gross turnover. Manufacturing was 20% of GNP before subtracting interindustry transactions. No value-added figures are given for any industry or sector. Engineering included foundries and electrical and engineering repairs. He notes that engineering employees are among the most skillful and highly paid in the country. See p. 23, and pp. 48-9.

TABLE VIII - 8 ENGINEERING AND MANUFACTURING EMPLOYMENT, FEDERATED MALAY STATES, 1921 AND 1931

	EMPLOYMENT	% OF TOTAL MANUFACTURING EMPLOYMENT
1921		
General Engineering	6,362	14.5
Manufacture of Vehicles (Cycles and Carts)	468	1.1
Shipbuilding and Repairing, and Marine Engineering	122	0.3
Total Engineering	6,952	15.9
Total Manufacturing	43,800	5.3 (% of Working Population)
Total Working Population	831,569	
1931		
General and Undefined Mechanical Engineering	6,916	9.2
Electrical Work	1,680	2.2
Foundry and Forge Work	2,490	3.3
Motor Car and Cycle Repair	2,236	3.0
Total Engineering	13,322	17.6
Total Manufacturing	75,495	9.0 (% of Working Population)
Total Working Population	837,811	

Sources and Notes: 1) 1921 and 1931 *Reports on the Census of Population of British Malaya*.

illustrate the existence of an important engineering sector immediately after the war. An indication that engineering also was important in manufacturing long before the Second World War is given in Table 8. The high proportions of engineering in manufacturing employment in the Federated Malay States in 1921 and 1931 shows that the industry was one of the earliest manufacturing sectors to be established. These figures compare with the 15.8% of 1968 manufacturing workforce in West Malaysia in engineering,[1] although the percentage in the states which once formed the Federated Malay States would be higher.[2]

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[1] *CManI*, 1968.

[2] The Census of Manufacturing does not give a cross-classification of state by industrial groups which would allow this percentage to be calculated. To calculate the percentage for the whole of Malaya (excluding Singapore) for 1921 and 1931 would involve lengthy and tedious additions by individual industries and states.

TABLE VIII - 9 NON-WAGE VALUE-ADDED PER WORKER, AND FIXED ASSETS PER WORKER IN SELECTED MANUFACTURING INDUSTRIES, AND CONSTRUCTION, 1968

	TOTAL ANNUAL NON-WAGE VALUE -ADDED PER FULL TIME WORKER ($)	TOTAL ANNUAL WAGE PER FULL TIME WORKER ($)	VALUE OF FIXED ASSETS: TOTAL ANNUAL VALUE ADDED
Industrial Machinery and Parts (Industry 4623)	1,858	2,049	0.36
Fabricated Structural Shapes (Industry 4510)	1,723	2,773	1.32
Metal Products (Major Group 45)	2,913	2,154	0.84
Machinery except Electrical Machinery (Major Group 46)	2,249	2,125	0.70
Electrical Machinery (Major Group 47)	7,600	2,458	0.90
Transport Equipment (Major Group 48)	3,204	2,043	1.87
All Covered Industries	5,024	2,209	1.02
Pioneer Industries	9,493	2,792	1.61
All Covered non-Pioneer Industries	3,993	2,075	0.74
All Construction Industries (Division 5)	2,153	2,626	...
Non-Residential Construction (Industry 5112)	928	2,379	...
Rubber Smokehouses off Estates (Industry 1122)	3,501	1,244	1.89
Manufacture of Chemical Fertilizers (Industry 4113)	13,850	4,279	3.72

Sources and Notes: 1) Figures calculated from CManI, 1968, and SCI, 1968.
2) Value-Added per worker figures are Total Non-Wage Value-Added divided by the number of full-time workers only. Inclusion of part-time workers would lower slightly all value-added per worker figures, and produce slight differences in relative values between industries. They would not affect the general orders of magnitude. Identical comments apply to wages per full-time worker.

Some clue to the early development of engineering can be found in Table 9. The non-wage value-added (NWVA) per worker indicates a very low degree of capital intensity relative to other manufacturing in both Machinery and Metal Products, the two earliest branches to develop, and even more strikingly in Construction. The NWVA figures check with the ratio of fixed assets to value-added, also in Table 9, except for Fabricated Structural Shapes. In the latter case it is possible that the newness

of capital equipment in recently established large firms has inflated the capital intensity in relation to, say, Industrial Machinery and Parts, where firms are older established. Off-estate smokehouses and chemical fertilizers have been included as examples of the traditional and the most modern activities, respectively. It is interesting that engineering has a much lower value-added per man than do smokehouses. The low capital intensity of mechanical and (possibly) structural engineering and construction would lend itself, one might assume, to local participation in those industries. It would seem that the industries' production functions were well suited to the prevailing factor endowment.[1] In spite of the low capital intensity, engineering has been a substantial user, and trainer, of skilled labour. The average wages per man-year are little below the average for all manufacturing in the case of the metal products and machinery groups, indicating that labour quality in these branches is comparable to the rest of manufacturing, while those of Non-Residential Construction are above the manufacturing average. In Industrial Machinery and Parts a recent survey by the Ministry of Labour[2] showed that 71.8% of workers earned over $200 a month.[3] Whilst it is not known the exact extent to which the newer

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[1] A full investigation of the factor endowment of Malaysia both now and in the past would be a major operation. The comments above are based on what seems intuitively plausible - that entry is easier if large capital sums (per unit of output) are not necessary, and that capital was in short supply except in the European owned part of the sector.

[2] Cycle of Occupational Surveys, West Malaysia, 1969, No. 4.

[3] $200 a month, about $8 a day, is widely accepted as the minimum wage for a skilled worker i.e. a worker who has served an apprenticeship followed by about five years experience, in engineering.

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engineering branches - electrical engineering and transport equipment - trained their own workers, it is clear from Section 2 that most workers in the 45 and 46 Groups were trained within those groups. Moreover, their skills are highly transferable to other industries, fitters, boilermakers, mechanics, etc, being in general demand. Indeed many firms interviewed for Section 2 complained of skilled workers being attracted away by new large forms or other industries.

The development of engineering in Malaysia relative to other countries in Asia can be assessed with the help of a recent survey by the United Nations Economic Commission for Asia and the Far East.[1] This survey showed that by 1966 Malaysia had reached the middle rank of Asian engineering producers. Japan, with engineering gross output as 30% of manufacturing, had reached Western levels. Australia (22%) and New Zealand (23%) were close behind, and also Taiwan (18%) and India (20%). Malaysia ranked with South Korea, Pakistan, Hongkong and the Phillipines in the 10 - 15% group, while other countries such as Cambodia and Ceylon were below this.[2]

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[1] UN, ECAFE, Industrial Development. Asia and the Far East, Volume IV, Development of Key Industries, (Bangkok, 1966)., pp. 97-146 contains a sectoral study of the engineering industries.

[2] Ibid., p. 97 and p. 142.

CHAPTER IX

CONCLUSION

Analysis of the role of tin and rubber exports in promoting economic growth in West Malaysia has been set out in this study in a series of stages.

First there is the proportion of current export income initially retained in the country. This is calculated by breaking down current payments made out of export income into their constituent parts.[1] The breakdown, which also provides information for subsequent stages of the analysis, is conducted both for the present-day and, in annual time series form, back to the early years of this century. The proportion of export income retained is primarily of interest in the case of the "foreign" sectors,[2] tin dredging and rubber estates, where there is a presumption that income may be remitted abroad. The greater the proportion of income retained, the less apt is the description of an export industry as an "enclave." The initial retention of a proportion

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[1] The principal constituents are wage payments, payments for materials, (and interinudstry services), dividend payments, tax and duty payments, and depreciation allowances. Depreciation allowances are treated as a local payment, though they could be remitted abroad at a later stage. All the others can have both foreign and local components.

[2] Except for a few cases of Japanese investment in Malaysia (especially important in iron mining for instance, which is an industry not covered by this study) "foreign" can be identified with "European", as defined in Chapters I and III.

of income in the domestic economy is a necessary condition for an export industry to promote economic development other than by purely technological externalities.[1]

In both tin dredging and rubber estates, over 70% of export income is used for local payments. The proportion was also calculated for gravel pump mining, for purposes of comparison with dredging, and is over 85%.[2] The high proportion in dredging is a relatively recent phenomenon. At the time immediately before a local tax on company profits was imposed in 1948, it is likely that the proportion was about 40%, and certainly no more than 55%.[3] The increase to the present is due partly to the imposition of Malaysian tax at increasingly high rates, which now takes 20% of dredging export income, in addition to the 15% export duty which has been in force for virtually the whole period of study. The other reason is the increase in local ownership of dredging company shares, over a third of which are in local hands.[4] Local dividend payments are now equal to nearly 10% of export income. Over the 1946-60 period few changes occurred in the input structure of dredging. Before the Second World War however, the proportion of

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1 If all income were remitted abroad immediately, the enclave would not even provide foreign exchange for the host economy. Also, one of the most important technological externalities, the training of local labour, would not operate.

2 Sufficient data do not exist to calculate a similar breakdown for smallholders' rubber. Since their only materials purchases (acid, fertilizer, and tools) are almost all made locally, it is unlikely that any of their income flows abroad on the first round of the multiplier.

3 The difference between the 40% and 55% figures is made up of payments "unallocated" between local and foreign. See Tables IV - 20 and 21. This difficulty also applies to rubber and to gravel pump tin.

4 Unfortunately, "local" here has to include Singaporeans who are included as "local" in many companies' share records.

wages paid was only half of the postwar figure. This further reduced the proportion of local payments. Dredging's main material input is electricity, a local purchase accounting for nearly 9% of export income.

In the rubber estate sector the high proportion of export income retained locally is due in large part to the importance of wage payments, which are at least 40% of export income and have been so in most years since the 1920's.[1] Local tax payments are about 10% of export and export duty about 5%. About 20% of profits accrue to local people after tax and duty payments. The proportion is slightly higher than in the past because of local purchasing of foreign estate land, but there has been no substantial increase in local ownership of rubber company shares to match what has happened in tin dredging.[2]

Once the proportion of locally retained export earnings has been established, the economic effects of the local payments can be examined. One of the most important of these effects is the extent to which the export industry in question provides investment opportunities to industries which could supply inputs or use the export good as an input. Again, such opportunities are particularly important if the export industry is "foreign".[3] Dredging and gravel pumping have almost

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[1] In years of very high rubber prices the proportion of wages tends to fall. This is discussed later in this chapter in connection with export industry multipliers.

[2] There has been in fact a substantial rise in the local ownership of locally-incorporated public rubber companies. However, most public rubber companies are incorporated in the United Kingdom, and local ownership of shares in these is only about 7%.

[3] See Section III - 2 for a discussion of the economic significance of these forward and backward linkage effects.

certainly been responsible for the establishment of a large scale electricity supply industry, and for coal mining which flourished mainly in the interwar period, to meet their demands for fuel. Gravel pump mine demand for diesel oil may have been an important factor in the decision to set up petroleum refining in West Malaysia in the mid-1960's, and tin revenues were used by the government in the late nineteenth and early twentieth centuries to finance railway construction. In terms of "backward linkages", rubber has only generated investment opportunities in chemicals and chemical fertilizers, purchases of which are less than 9% of export income (and below 5% in some recent years), in comparison to the 14% and 23% points represented by the respective materials purchases of dredging and gravel pump mining.[1] Moreover, agricultural chemical production has been an exercise in import substitution in a highly protected home market. In addition, a tin smelting industry has developed and a small proportion of rubber output is used in the local production of rubber goods. It has not been possible to establish empirically whether investment in industries linked to the export industries has been at the expense of investment elsewhere in the economy, nor in any detail what the sources of such investment were except in recent cases.[2] If such investment opportunities did encourage

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[1] In absolute terms, materials purchases by the two tin sectors combined are more than double those of the rubber estate sector, while smallholder demand for fertilizer is low.

[2] It is known that tin mining interests played a part in establishing local production of coal.

domestic savings,[1] capital formation was increased. If not, they nevertheless introduced new types of production and technology into the economy; while electricity, petroleum and transport facilities helped the establishment of other industries. In any case, in terms of capital formation linkages are not of great importance compared to the capital formation in export industries themselves, and the technological externalities which exports generate.

Linkage effects may also be generated by final demand purchases and by investment expenditure. It has been shown in this study that at least 65%, and possibly a higher proportion of wages are spent locally. However, most of this expenditure is on simple foodstuffs and services and offers little scope for investment in industry.[2] Regression analysis shows that over the last twenty years changes in export earnings in rubber have not been associated significantly with changes in wage payments, and that while the association between export earnings and wage payments in the two tin sectors is strong, the export multipliers generated thereby are small.

The proportion of local purchases in total investment expenditure is about 25% for new dredge construction, 40% for gravel pump mines, and at least 70% for rubber (including factory construction). These

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[1] They might also have channelled it away from investment in residential construction, a favourite form of security among local businessmen.

[2] This is not to say that industrial development is the only means of achieving economic growth. Nevertheless, the production of simple foods and services offers (with some exceptions) little scope for capital formation and introduces little new technology into the economy.

local purchases have given rise to the establishment of a local light engineering industry, which has been made the subject here of a special case study. Before the study was made, little was known of the Malaysian engineering industry, and virtually nothing had been written about it. The case study shows that the local production of simple tin and rubber machinery, and the erection of dredges, goes back over fifty years. The making of simple equipment was well suited to domestic factor endowment in the early years. It has formed the basis for increasingly sophisticated production, and a gradual process of import substitution has occurred in response to market forces.

Direct participation of local people in export production has been important in rubber, where a large smallholding acreage is owned by Malays, Chinese and Indians. Gravel pumping is a local sector but ownership is almost entirely limited to Chinese. In dredging direct local participation, other than the buying of shares in existing companies, is a feature only of the late 1960's. Increasing returns to scale in dredging have made for high capital costs, which make new entry difficult. The existence of economies of scale in dredging has been demonstrated in this study by time series regression analysis.

An important aspect of local participation is the extent to which the Malays have been integrated into the export industries. Malay participation in development is a key aspect of government policy. Malay rubber smallholders have already been mentioned. In addition, nearly 40% of the dredging labour force is Malay, although Malays tend to occupy the less skilled positions. In gravel pumping the proportion is only 10%, while it is over 20% on rubber estates. One important possibility of increasing Malay participation is of setting up Malays

in business in the gravel pump mining sector if tin deposits are found in Malay Reservations. Gravel pump mining's low initial capital requirements, its high rate of return on investment (which is discussed below) and its moderate skill requirements would make for easier and more profitable entry than into manufacturing.

The extent to which the various export industries have improved the quality of the labour force has differed. In dredging the average wage is well above that in domestic manufacturing, while that of gravel pumping is at about the average manufacturing level. Nearly 40% of the dredging labour force consists of skilled artisans and junior supervisory staff, in addition to which there are highly qualified mine managers, dredge masters, etc. 20% of the gravel pump mining labour force is skilled. The proportion for rubber is 7% (and 11% in oil palm),[1] while the average wage in both rubber and oil palm is only two thirds that of manufacturing.

The training of skilled labour is also a technological externality offered by the export industries to the domestic economy. Although both rubber and oil palm have low proportions of skilled labour in their workforce, the number of skilled workers generaged for a given value of output is much greater than in tin, because their overall proportions of labour to output are very high. The same is true of the generation of skilled labour per unit of investment, except that gravel pumping's very low initial capital requirements give it a very high coefficient. Of course, the life of capital equipment in gravel pumping is very much

[1] Oil palm statistics have been introduced at a number of points in the study to provide comparison with rubber. Time was not available for a full-scale analysis of oil palm.

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shorter than in the other sectors. The provision of other externalities such as the supply of entrepreneurs has been difficult to establish. It is unlikely, for example, that many Malay rubber smallholders learnt their skills on estates. In the engineering industry no owner or manager was found who had previously worked in the export sector. All had started their work in other engineering firms, although in the early days some may have come from the tin and rubber industries.

Mining has introduced a new (industrial) technology to Malaysia, while rubber growing has at least lengthened peasants' time horizons. The industries linked to tin have also been of a modern type which introduces unfamiliar technology to the economy. The capital intensity of tin production in terms of non-wage value-added per head is as high as manufacturing in the case of gravel pumping and very much higher in the case of dredging, although on estates it is much lower.

It seems then that tin mining has promoted development in almost all the ways open to an export industry.[1] It has provided substantial tax revenues, it has generated important linkages, and greatly improved the quality of its labour force. The externalities and labour improvements generated by rubber have been much less.[2] Rubber's greatest contribution has been as an enormous provider of foreign exchange which has enabled Malaysia so far largely to avoid the balance of payments constraint faced by many poor countries. It has also spread

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[1] Other than local direct entry in the case of dredging, though as noted above, direct entry into the industry had started by the mid-1960's.

[2] Also the rate of return on investment in both tin sectors appears to be higher than in either rubber or oil palm.

development over a wider geographical area in Malaysia, particularly into the east coast states, than has tin. In land development schemes rubber (and oil palm) offers great scope for improving the incomes of the rural poor. Moreover, the low incomes of many existing rubber smallholders reflect the inadequate size of their holdings, not any deficiency in the income-increasing potentiality of rubber. With Malaysia's abundant unused supplies of land, such difficulties could be overcome. Moreover, the employment generating effects of rubber are large, an important consideration when chronic unemployment is a problem. If in the future the unemployment problem is solved, factor substitution in rubber could be used to raise incomes further. On Federal Land Development Authority schemes the size of holding per family could be increased in such circumstances with little loss of output[1] and labour saving improvements such as the polybag collection of latex could further reduce labour requirements.

This study has not included work on the terms of trade of West Malaysia, since this topic has been covered by other studies. A recent paper has shown that over the 1950-65 period the income terms of trade of West Malaysia have risen by nearly 90%, while the average 1962-65 commodity terms of trade, though lower than in the 1954-61 period, are higher than they were in 1950-53.[2]

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[1] FLDA schemes deliberately use a lower man-land ratio than estates in order to generate more employment and to spread the benefits of the schemes over more people. A family with no outside employment could well manage a twenty acre plot (on an alternate-day tapping system) instead of the eight acre plot now common.

[2] T. Wilson, R.P. Sinha, and J.R. Castree, "The Income Terms of Trade of Developed and Developing Countries", <u>Economic Journal</u>, December 1969, p. 820.

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APPENDICES

APPENDIX IV - 1 MALAYAN TIN OUTPUT, 1874-1968

a) Total Tin Output, 1874-1968

YEAR	TONS	YEAR	TONS	YEAR	TONS
1874	657	1904	50,967	1934	33,919
75	1,762	05	50,991	35	42,319
76	2,257	06	46,941	36	66,703
77	2,893	07	48,431	37	77,192
78	5,969	08	50,837	38	43,260
79	6,638	09	49,641	39	53,084
1880	8,254	1910	44,999	1940	83,468
81	9,026	11	45,296	45	3,152
82	10,618	12	49,505	46	8,432
83	13,763	13	51,390	47	27,026
84	14,751	14	50,689	48	44,815
85	15,879	15	49,896	49	55,203
86	17,670	16	47,311	1950	57,767
87	21,867	17	42,988	51	57,396
88	22,155	18	39,612	52	57,065
89	26,029	19	39,322	53	56,404
1890	26,975	1920	37,439	54	60,933
91	32,114	21	36,569	55	61,244
92	33,501	22	37,710	56	62,296
93	37,761	23	39,653	57	59,293
94	48,357	24	46,144	58	38,458
95	48,210	25	48,700	59	37,525
96	46,510	26	48,079	60	51,979
97	42,393	27	54,535	61	56,028
98	39,569	28	64,853	62	58,603
99	38,353	29	69,357	63	59,947
1900	42,444	1930	64,082	64	60,004
01	46,742	31	52,044	65	63,670
02	46,480	32	27,845	66	68,886
03	49,962	33	24,791	67	72,121
				68	75,068

Sources and Notes: 1) 1874-77, Perak only; 1878-84, Perak and Selangor only; 1885-8, Perak, Selangor and Negri Sembilan only; 1889-1909 FMS only; 1910-40 FMS and UMS; 1945-68, MU/FM/WM excluding Singapore (which however has no tin production.)
2) Figures are for exports to 1930; sales from FMS and exports from UMS to 1939; and production to 1968.
3) 1874-1897 from Wong Lin Ken, The Malayan Tin Industry to 1914, op.cit., p. 249; 1898-1938 from L.L. Fermor Report Upon the Mining Industry of Malaya, op.cit., p. 61; 1939 from AR Mines Department 1939; 1945-66 from BSMI to 31st December 1955 BSMI 1955-60; Annual BSMI 1961-66; 1967 and 1968 from MBS WM, July 1969.

b) Federated Malay States Tin Output, 1910-39

YEAR	TONS	YEAR	TONS
1910	43,862	1925	45,926
11	44,148	26	45,947
12	48,228	27	52,180
13	50,126	28	61,935
14	49,042	29	67,043
15	46,761	30	62,065
16	43,869	31	50,654
17	39,832	32	26,538
18	37,369	33	23,894
19	36,935	34	32,567
20	34,935	35	40,787
21	34,491	36	64,682
22	35,285	37	75,118
23	37,649	38	41,206
24	44,044	39	49,525

Sources and Notes: 1) Sources as for Part a.
2) Covers only years for which FMS output is grouped with UMS output in Part a.

APPENDIX IV - 2

OUTPUT OF TIN, BY MINING METHOD, 1928-68

(Tons)

	DREDGING	GRAVEL PUMPING	HYDRAUL-ICING	OPEN CAST	UNDER-GROUND	DULANG	OTHER
1928	25,820	38,460	5,196	3,995	3,450	1,554	2,107
29	27,211	29,031	5,864	2,745	3,244	1,057	847
1930	24,728	28,218	4,578	2,698	3,035	962	764
31	22,068	20,394	3,372	2,927	2,383	1,414	557
32	11,869	10,477	1,610	1,261	1,199	971	440
33	10,759	8,713	1,359	1,101	957	735	269
34	16,834	13,699	1,879	940	1,755	760	347
35	18,302	16,691	2,036	934	1,522	871	435
36	30,455	24,833	3,149	2,558	2,598	1,028	61
37	36,157	28,712	3,248	3,020	2,910	1,005	66
38	18,539	15,772	2,324	1,769	1,734	1,029	38
1939	23,542	18,052	2,865	1,820	2,174	1,017	55
1946	2,067	2,707	560	8	140	2,142	808
47	12,826	8,827	1,546	324	690	1,768	1,045
48	21,932	16,253	2,191	561	1,228	2,413	237
49	27,821	19,345	2,222	657	2,330	2,634	294
1950	28,117	21,346	2,202	664	2,692	2,465	281
51	30,216	19,663	1,444	1,036	2,669	2,179	189
52	29,705	21,673	1,287	1,045	2,304	906	145
53	28,716	21,837	1,176	1,267	2,253	970	185
54	31,794	22,781	1,392	1,362	2,260	1,086	258
55	31,049	23,994	1,346	1,230	2,242	1,090	293
56	30,705	24,934	1,472	1,370	2,402	1,100	313
57	28,117	24,396	1,630	1,259	2,523	1,073	295
58	19,890	14,022	722	926	1,692	849	357
59	18,860	13,903	765	892	1,812	629	422
1960	28,009	17,855	1,158	930	2,269	957	437
61	29,627	19,340	1,349	1,414	2,319	1,039	413
62	28,517	22,105	1,296	2,025	2,361	1,273	397
63	27,541	23,773	1,168	2,421	2,229	1,647	307
64	25,694	26,906	263	1,594	2,109	1,879	469
65	24,975	30,859	191	1,642	2,078	2,028	992
66	23,771	36,813	176	2,083	1,998	2,175	837
67	23,838	40,067	238	2,252	1,912	2,372	442
68	23,154	43,452	248	2,061	2,016	2,681	208

Sources and Notes: 1) 1928 is earliest available figure.
2) 1928-39 are FMS only, 1946-68 are for MU/FM/WM, excluding Singapore.
3) 1928 from L.L. Fermor, op.cit. p. 113; 1929-39 from AR Mines Department FMS 1939; 1946-66 are from BSMI to 31st December 1955 BSMI 1955-60, Annual BSMI, 1961-66; 1967 and 1968 from MBS, June 1970.

APPENDIX IV - 3

MINING LABOUR FORCE, 1903, 1910-68

YEAR	DREDGING	GRAVEL PUMPING	HYDRAU-LICING	OPEN CAST	UNDER-GROUND	TOTAL ALL MINING	TOTAL TIN	DULANG WASHERS
1903	-	22,391		143,028	20,918	186,337	...	...
1910	-	28,521		122,686	19,154	170,361	...	10,257
11	-	30,881		150,439	15,107	196,427	...	10,907
12	-	35,494		157,081	18,834	211,409	...	12,031
13	228	36,681		167,669	20,454	225,032	...	14,155
14	508	32,373		124,015	14,793	171,689	...	14,877
15	1,521	33,089		118,454	11,393	164,457	...	15,859
16	1,918	31,403		94,890	10,932	139,143	...	14,007
17	2,156	28,922		81,660	10,602	123,340	...	13,870
18	2,562	33,384		97,082	11,593	144,621	...	15,774
19	2,734	27,781		73,632	9,960	113,107	...	15,553
1920	2,844	35,139		41,854	9,722	89,559	...	12,867
21	5,608	29,973		40,699	10,058	86,338	...	13,418
22	5,189	31,947		36,545	8,514	82,195	...	12,753
23	5,606	45,401		43,024	11,631	96,662	...	7,849
24	6,584	39,295	12,068	40,491	8,041	106,479	...	7,794
25	7,497	49,575	13,818	29,379	6,988	167,257	...	7,792
26	9,057	54,592	11,659	28,556	6,429	110,293	...	5,923
27	11,120	64,567	12,476	28,417	6,308	122,888	...	7,536
28	14,212	59,834	10,108	19,087	5,900	109,141	...	10,409
29	16,817	59,160	9,003	13,338	6,150	104,468	100,039	8,947
1930	12,293	41,076	9,111	12,202	5,846	80,528	76,796	7,784
31	9,214	25,599	5,574	12,731	3,920	57,038	53,919	8,739
32	6,991	16,555	4,991	12,494	3,424	41,455	41,014	8,975
33	6,545	17,616	4,809	10,616	3,276	42,862	39,380	9,028
34	8,935	28,759	4,616	7,898	4,491	54,619	50,464	9,696
35	10,537	31,070	4,993	11,467	4,777	62,844	57,263	9,701
36	15,506	42,197	4,822	10,951	6,742	80,218	73,468	9,851
37	16,154	47,382	4,664	13,378	6,707	88,285	80,648	9,858
38	12,934	23,246	3,797	11,623	6,063	57,663	50,402	9,687
39	16,438	36,555	...	11,389	4,952	72,954	65,556	9,822
1946	8,184	7,882	2,726	3,647	2,345	26,019	23,026	22,973
47	12,493	19,418	2,830	3,516	3,510	42,748	39,362	21,109
48	15,235	23,611	3,040	4,195	4,434	51,270	46,861	20,281
49	15,776	23,584	2,568	3,622	6,438	52,757	47,107	19,306
1950	15,732	23,968	2,489	3,403	5,940	53,206	47,201	18,702
51	15,486	23,707	1,471	3,484	6,766	51,423	45,931	6,400
52	14,882	23,179	1,465	6,411	4,740	51,168	44,659	6,659
53	13,488	17,172	1,310	4,923	4,243	41,661	36,899	7,801
54	14,077	19,327	1,344	4,719	3,780	43,665	39,715	7,742
55	14,442	19,163	1,283	5,223	3,859	44,407	55,559	8,762
56	14,322	18,917	1,435	5,814	3,283	44,127	39,459	7,775
57	13,781	16,854	1,529	6,072	3,342	41,879	36,585	7,957
58	9,555	9,292	1,201	4,678	2,496	27,654	23,153	7,945
59	8,593	10,703	1,024	5,704	2,588	29,295	23,778	7,937
1960	11,334	12,771	1,241	7,892	2,807	36,736	29,242	7,889
61	11,438	15,471	1,235	8,690	2,663	40,365	32,459	8,379
62	10,933	16,567	1,211	9,930	2,678	42,359	33,373	11,266
63	11,156	17,984	239	8,347	2,549	41,137	33,650	13,529
64	10,910	22,646	256	7,742	2,615	45,325	38,387	14,797
65	10,676	29,292	136	7,365	2,672	51,801	45,345	15,663
66	10,785	33,608	120	7,919	2,542	55,395	48,800	16,945
67	10,520	32,290	130*	7,160	2,630	53,930	49,224	...
68	10,673	32,514	141	6,159	2,534	53,639	48,675	20,794

(Continued on next page)

APPENDIX IV - 3 (Continued)

Sources and Notes: 1) Pre-1939 figures are for FMS. 1946-68 for MU/FM/WM.
2) 1903 from AR Resident-General, FMS, 1903; 1910-39 from AR Mines Department, FMS 1939; 1946-55 from BSMI to 31 December 1955; 1956 from BSMI 1956-60; 1961-66 from Annual BSMI, 1961-66; 1967 from (except hydraulicing) HLS 1967, and 1968 from Annual BSMI, 1968. BSMI also give labour statistics by mining product.
3) All employment figures for individual methods include non-tin mining employment. Totals exclude dulang washers.
4) The 1903 combined figure for hydraulicing and gravel pumping includes lampanning and individual miners. The 1910 and later figures are given in tables which do have a 'Miscellaneous' column, although it is still possible that some lampanning may be included under gravel pumping/hydraulicing. 1903 is therefore not a very reliable basis of comparison with later figures. 1903 the only year before 1910 in which a complete set of employment figures by methods of mining is available for FMS.
5) 1939 hydraulicing misprinted in original table as 11,389.

APPENDIX IV - 4

ANNUAL AVERAGE TIN PRICES 1874-1968

($ per Pikul)

YEAR	$	$	YEAR	$	YEAR	$
1874	30		1904	77	1934	114
75	23		05	82	31	111
76	21		06	90	36	100
77	18		07	85	37	120
78	18		08	67	38	95
79	21		09	68	39	114
1880	26		1910	78	1946	170
81	28		11	94	47	218
82	31		12	103	48	281
83	30		13	100	49	294
84	25		14	73	1950	367
85	23		15	78	51	527
86	34		16	86	52	480
87	37		17	109	53	363
88	42		18	151	54	354
89	36		1919	121	55	365
1890	32		1920	151	56	387
91	31	33	21	85	57	373
92	35	37	22	81	58	369
93	31	38	23	102	59	397
94	33	38	24	124	1960	394
95	30	35	25	132	61	447
96	28	32	26	145	62	448
97		36	27	145	63	445
98		43	28	114	64	619
99		73	29	104	65	702
1900		74	1930	73	66	645
01		68	31	60	67	600
02		79	32	70	68	565
03		84	33	100		

Sources and Notes: 1) 1874-1890 are annual values of tin imported into SS from FMS, from Wong Lin Ken, op.cit., p. 250. Wong derived these figures from SS trade returns. This series is shown continued to 1896 to provide comparison with the 1891-1903 figures obtained originally from Mines Department sources.
2) 1891-1903, Straits refined tin in Singapore from ibid, p. 254.
3) 1904-68, Straits ex-works prices, from Fermor op.cit., p. 76. 1939-55 from BSMI to 31 December 1955; 1956-60 from BSMI 1955-60; 1961-66 from Annual BSMI, 1960-66; 1967-8 from MBS, July 1970.

APPENDIX IV - 5

HORSE POWER IN TIN MINING 1910-68

	ALL-MINING FMS		ALL-MINING FMS
1910	18,515	1925	103,306
11	20,623	26	118,846
12	22,608	27	138,601
13	25,756	28	158,733
14	41,623	29	180,152
15	56,197	30	169,870
16	58,074	31	132,440
17	55,576	32	131,623
18	60,040	33	110,752
19	57,343	34	154,065
20	64,360	35	171,995
21	59,200	36	233,346
22	59,278	37	293,124
23	73,300	38	233,389
24	79,077	39	263,386

	TOTAL TIN	DREDGING	GRAVEL PUMPING	HYDRAULIC	OPEN CAST	UNDER-GROUND	OTHER
1946	61,397	18,768	29,693	8,574	8,033	2,332	153
47	161,453	52,141	85,505	13,308	3,214	15,420	148
48	231,198	68,803	127,097	19,557	12,857	15,418	1,014
49	263,786	77,626	146,934	19,334	15,148	24,802	1,423
1950	297,563	86,030	170,087	17,305	13,075	29,554	1,424
51	318,806	93,928	188,175	14,990	15,687	27,791	733
52	323,500	90,299	203,003	15,506	24,764	13,730	1,060
53	306,539	95,681	182,930	11,203	26,273	13,023	1,428
54	348,220	102,177	214,628	13,372	35,959	10,979	2,189
55	364,906	102,109	236,287	11,402	38,336	10,841	2,788
56	386,092	104,825	252,219	11,661	53,894	9,972	2,347
57	380,886	108,462	237,229	12,788	63,109	14,747	1,648
58	306,157	96,763	181,164	8,657	57,606	13,262	3,759
59	281,629	81,021	172,456	8,483	65,614	14,126	3,593
1960	358,417	114,809	212,255	9,157	77,960	13,594	4,174
61	413,123	115,126	260,535	9,160	94,332	13,427	5,005
62	430,156	115,253	273,351	9,829	116,647	10,980	4,661
63	462,589	120,309	304,581	2,835	138,052	12,538	5,540
64	562,291	122,629	398,683	2,303	136,347	13,336	9,040
65	704,274	124,275	535,836	1,714	141,732	13,524	12,611
66	798,452	125,372	632,262	1,586	151,748	12,889	6,920
67	840,393	...	...	...	...	...	...
68	894,312	136,996	723,038	2,209	131,119	13,010	9,267

Sources and Notes: 1) Individual methods' HP includes HP used in non-tin mining.
2) All figures from BSMI to 31 December 1955, BSMI 1956-60, Annual BSMI's 1961-66 and 1968, which also give data by mining product.
3) HP figures are available before 1939 for all mining combined but only fragmentary information is available on HP by mining method. For 1934, 35, and 38, respectively total HP was 43,609, 50,527, 59,730 for dredges; and 67,772, 76,234, 93,316 for gravel pumping. (AR Mines Department, 1934, 1935, and 1938).

APPENDIX IV - 6

TIN DREDGING COMPANIES SAMPLE

a) List of Companies

(i) COMPANIES	(ii) COUNTRY OF INCORPORATION	(iii) DATE TO WHICH ANNUAL REPORT RUNS	(iv) PROCEEDS FROM SALES OF ORE SHOWN NET OR GROSS
Ayer Hitam Tin Dredging Ltd.	U.K.	30 June	Net
Killinghall Tin Ltd.	"	30 September	"
Kinta Kellas Tin Dredging Co.Ltd.	"	31 March	"
Petaling Tin Berhad	Malaysia	31 October	"
Sungei Way Dredging Berhad	"	30 June	"
Kamunting Tin Dredging Ltd.	U.K.	31 March	Gross
Ampat Tin Dredging Ltd.	"	31 December	"
Pengkalen Ltd.	"	30 September	"
Renong Tin Dredging Co. Ltd.,	"	31 December	"

Sources and Notes: 1) All data for the sample was obtained from these companies' annual reports. Reports for U.K. companies were obtained from the Companies Registration Office in London, and Malaysian company reports from the companies themselves.

b) Representative Worksheet - 1967

i) Current Payments as Percentages of Gross P

(£)	(i) GROSS PROCEEDS FROM SALES OF TIN ORE	(ii) OPERATING COSTS	(iii) REPAIRS AND RENEWALS	(iv) U.K. EX-PENSES	(v) MALAYSIAN TAX	(vi) U.K. TAX	(vii) DEPREC-IATION	(viii) NET DIVIDENDS
Ayer Hitam	1,441,159	575,413	...	27,534	266,201	-	177,551	370,237
Killinghall	368,672	358,294	7,000	4,653	58	-	39,095	-
Kinta Kellas	410,574	159,996	...	10,665	41,000	9,330	9,292	40,096
Petaling	1,162,389	849,885	...	...	23,693	-	81,050	98,826
Sungei Way	790,883	501,839	...	...	36,034	-	47,201	49,020
Kamunting	1,851,962	607,577	37,961	25,641	...	...	102,044	374,685
Ampat	546,064	276,458	1,021	7,762	99,000	15,000	8,376	187,500
Pengkalen	326,473	154,524	2,800	15,018	35,907	3,925	20,389	24,000
Renong	1,029,136	409,145	83,024	8,604	198,000	16,000	27,984	94,734
TOTALS	7,927,312	3,893,131	131,806	99,877	659,893	44,255	512,982	1,239,098
Mean % of Gross Proceeds		49.1	3.2	1.7	10.9	0.7	6.5	15.6

Columns ix to xii are on page 467.

APPENDIX IV - 6 (Continued)

(£)	(ix) TOTAL COSTS AS % OF GROSS PROCEEDS	(x) i x ix	(xi) i x $(ix)^2$	(xii) GROSS PROCEEDS AND OTHER PROCEEDS
Ayer Hitam	54.6	78,687,281	4,296,325,543	7,445,013
Killinghall	109.1	40,222,115	4,388,232,747	388,093
Kinta Kellas	43.8	17,983,141	787,661,576	...
Petaling	81.5	94,734,704	7,720,878,376	1,182,594
Sungei Way	80.4	63,586,993	5,112,394,237	802,747
Kamunting	49.2	91,172,089	4,488,401,941	1,961,486
Ampat	56.9	31,065,581	1,767,320,903	607,307
Pengkalen	65.8	21,498,247	1,415,659,565	367,678
Renong	51.4	52,856,425	2,714,705,988	1,087,767
TOTALS		491,806,576	32,691,580,876	7,842,585
Mean % of Gross Proceeds	62.0			104.34

Sources and Notes: 1) Mean % = ($\sum$Column x 100) $\div$ $\sum$Column i.
2) Where an item is not available the Gross Proceeds for the company concerned are deducted from total Gross Proceeds before the mean is calculated.
3) Kinta Kellas's Other Proceeds were inadvertently missed during the collection of data.
4) Kamunting tax payments are not included because they would be misleading. Part of the company's operations are in Thailand and Thai taxes are paid as well as U.K. and Malaysian tax.
5) U.K. expenses for the Malaysian based companies have not been assumed zero. They may well have had some remaining links with the U.K. and some U.K. expenses may have been incurred therefore.

b)
ii) Confidence Intervals for Total Costs as Percentage of Gross Proceeds

The Student t distribution is used (because the sample is small), together with a finite population correction factor.

$$\text{Population Mean} = \text{Sample Mean} \pm t. \frac{\text{Standard Deviation of Sample.}}{\sqrt{n}} \sqrt{\frac{N-n}{N-1}},$$

where n is size of sample (9), and N is size of population (35)

At 5% level of significance, with n - 1 (8) degrees of freedom, t = 2.306
10% " " " " " " " " t = 1.860
20% " " " " " " " " t = 1.397

Therefore, for 1967, Population Mean = $62.04 \pm t. \left(\frac{16.58}{3} \cdot 0.874\right) = 62.04 \pm t. \; 4.8303$

At 5% level of significance Mean $\pm$ 11.139 = 50.901 to 73.179
10% " " " Mean $\pm$ 8.984 = 53.056 to 71.024
20% " " " Mean $\pm$ 6.750 = 55.29 to 68.79

[illegible]

APPENDIX IV - 7

OWNERSHIP OF CAPITAL IN MALAYSIAN TIN DREDGING COMPANIES : WORKSHEET

	(i) PAR VALUE OF ISSUED CAPITAL ($000)	(ii) UNIT PAR VALUE OF SHARES ($)	(iii) CURRENT (1970) PRICE OF SHARES ($)	(iv) CURRENT VALUE OF ISSUED CAPITAL ($000) (i x iii / ii)	(v) PROPORTION OF SHARES OWNED BY MALAYSIAN RESIDENTS	(vi) iv x v	(vii) iv x v^2
1. Malaysian-incorporated Companies							
Austral Amalgamated Tin Bhd.	10,000	1.00	1.80	18,000	0.503	9,054	4,554
Berjuntai Tin Dredging Bhd.	23,438	2.50	11.50	107,815	0.470	50,673	23,816
Johan Tin Dredging Bhd.	136	1.00	...	136(Par Value)	0.135	18	2
Kampong Kamunting Tin Dredging Bhd.	1,135	1.80	...	1,135(Par Value)	0.553	628	347
Kampong Lanjut Tin Dredging Bhd.	6,000	1.50	3.90	15,600	0.871	13,588	11,835
Kuala Kampar Tin Fields Bhd.	6,150	2.50	2.90	7,134	0.378	2,697	1,019
Larut Tin Fields Bhd.	600	1.00	4.00	2,400	0.607	1,457	884
Lower Perak Tin Dredging Bhd.	6,600	2.00	3.00	9,900	0.416	4,118	1,713
Petaling Tin Bhd.	7,059	1.00	2.65	18,706	0.660	12,346	8,148
Rantau Tin Dredging Sdn Bhd.	1,450	...	...	1,450(Par Value)	0.686	995	683
Selangor Dredging Bhd.	6,993	1.00	2.20	15,385	0.931	14,323	13,335
Sungei Way Dredging Bhd.	7,013	1.00	0.96	6,732	0.782	5,264	4,116
Sub-Total				204,393	0.563	115,161	70,452
2. UK-incorporated Companies	(£000)	(£)	(£)	(£000)			
Kamunting Tin Dredging Ltd.	1,003	0.25	0.40	1,605	0.108	173	19
Southern Kinta Consolidated Ltd.	770	0.10	0.76	5,852	0.196	1,147	225
Ampat Tin Dredging Ltd.	31	0.025	0.21	260	0.249	65	16
Malayan Tin Dredging Ltd.	1,852	0.25	0.90	6,667	0.147	980	144
Southern Malayan Tin Dredging Ltd.	1,442	0.25	0.89	5,134	0.132	678	89
Renong Tin Dredging Co. Ltd.	140	0.10	0.55	770	0.700	539	377
Ayer Hitam Tin Dredging Ltd.	1,525	0.25	1.19	7,259	0.200	1,452	290
Tronoh Mines Ltd.	2,579	0.25	0.47	4,849	0.300	1,455	437
Sub-Total				(£) 32,396	0.200	6,489	1,597
3. Malaysian-incorporated Companies not listed above (2 companies)				($) 4,237	*0.563		
4. UK-incorporated Companies not listed above (7 companies)				(£) 3,679	*0.200		
5. All Companies (29 companies)				($)473,782	*0.351		

Sources and Notes are given on page 469.

APPENDIX IV - 7 (Continued)

Sources and Notes: 1) Names of companies from Yip "Recent Changes in the Ownership and Control of Locally Incorporated Tin Dredging Companies in Malaya", op.cit., pp. 81-82. Of the 18 Malaysian-incorporated companies in Yip, 4 have been omitted as operating in Thailand (Aokam, Katu, Pungau, Tongkah Harbour). Of the 17 Overseas-incorporated companies, one is omitted as operating principally in Thailand (Siamese Tin Syndicate) and another as Australian (Sungei Bidor) for which the necessary data is not available. Thus there are 14 Malaysian- and 15 UK-incorporated companies covered.
2) Columns i and ii from Stock Exchange of Malaysia and Singapore, Company Reports 1969, op.cit., except for Rantau figures which are from Yip, op.cit., p. 81.
3) Column iii from Straits Times, (Kuala Lumpur), 13-15 April 1970 for Malaysian companies, and Financial Times (London) 10 March 1970 for UK companies. The slight difference in dates is unlikely to have affected the results significantly.
4) Column v from Yip, op.cit., p. 83 for Malaysian companies. UK data based on postal survey conducted in March-April 1970 of all UK-registered dredging companies operating in Malaysia. 8 out of 15 companies provided the data requested.
5) Confidence intervals at 5% level of significance for UK companies sample, with finite population correction factor relating size of sample (8) to size of population (15), are 0.143 (14.3%) to 25.7%, using Student t distribution. Standard deviation is 0.096. These confidence limits should be treated with great care since the sample was not truly random. However, there appears no systematic bias in the response. The lower confidence limit is inoperative (see note 6.)
6) The 8 UK sample companies account for a strikingly high proportion (89.8%) of the total current value of issued capital of all 15 UK companies. If it is assumed that the 7 non-sample companies have no Malaysian shareholders, and this (zero) shareholding is weighted by the companies' issued capital, then the overall Malaysian shareholding in UK companies is 17.96%. If the non-sample companies had 100% Malaysian shareholding, the figure for all UK companies would be 28.16%. The minimum figure is above the 5% lower confidence limit, thus rendering the latter inoperative.
7) In order to calculate the overall Malaysian shareholding (35.1%) in all dredging companies, it is assumed that Malaysian companies for which data are not given in Yip, and UK non-sample companies, have the same average Malaysian shareholding as do the Malaysian and UK companies, respectively, for which data are available.
8) The coefficients of variation (standard deviation as percentage of mean) are 29.3% for the 12 Malaysian companies and 48.0% for the 8 UK companies for which shareholdings are available.

APPENDIX IV - 8 TIN MINING WAGES 1946-68

a) Wages 1946-68

	DREDGING				GRAVEL PUMP MINING			
	(i) AVERAGE MONTHLY WAGE($)	(ii) EMPLOY-MENT	(iii) ANNUAL WAGE BILL ($000) (i x ii x 12)	(iv) ANNUAL WAGE BILL INCL. MANAGEMENT & PROFESSIONAL SALARIES (iii x 1.3)	(v) AVERAGE MONTHLY WAGE($)	(vi) EMPLOY-MENT	(vii) ANNUAL WAGE BILL ($000) (v x vi x 12)	(viii) ANNUAL WAGE BILL INCL. MANAGEMENT & PROFESSIONAL SALARIES (vii x 1.2)
1946	* 80.6	8,184	7,914	10,288	* 41.0	7,882	3,875	4,650
47	80.6	12,493	12,081	15,705	41.0	19,418	9,546	11,455
48	56.3	15,235	10,650	13,845	70.9	23,611	20,094	24,113
49	68.5	15,776	12,961	16,849	68.8	23,584	19,468	23,362
1950	* 81.6	15,732	15,405	20,026	98.1	15,732	18,514	22,217
51	* 94.7	15,486	17,598	22,877	* 96.2	23,707	27,367	32,840
52	*107.8	14,882	19,251	25,026	* 94.3	23,179	26,229	31,475
53	120.7	13,488	19,539	25,400	92.5	17,172	19,053	22,863
54	124.5	14,077	21,039	27,350	96.3	21,915	22,341	26,809
55	126.1	14,442	21,855	28,411	* 97.5	19,163	22,421	26,905
56	128.2	14,322	22,037	28,648	98.7	26,240	34,683	41,620
57	140.4	15,170	25,568	33,239	114.3	19,940	27,342	32,810
58	*136.8	9,555	15,685	20,390	*102.2	19,292	23,660	28,392
59	133.1	8.593	13,773	17,839	90.2	10,703	11,585	13,902
1960	142.4	11,334	19,374	25,186	104.4	12,771	16,006	19,207
61	148.2	11,438	20.348	26,452	110.0	15,471	20,425	24,509
62	*159.5	10,933	20,926	27,204	*114.0	16,567	22,664	27,197
63	170.8	11,156	22,865	29,724	*118.0	17,984	25,465	30,558
64	182.2	12,340	26,976	35,069	122.1	22,646	33,195	39,834
65	182.0	11,126	31,012	40,315	134.0	29,294	47,108	56,527
66	*188.0	10,785	24,331	31,630	*141.2	32,608	55,251	66,301
67	194.0	11,738	27,332	35,531	148.4	32,290	57,541	69,049
68	198.0	10,720	25,469	33,109	142.6	35,514	55,628	66,754

Sources and Notes: 1) Calculation of average monthly wage is shown in section b of this Appendix. Asterisked items are estimates for years for which no wage data are available.
2) Employment figures are the largest of Ministry of Labour, Mines Department, and CMinI sources. Ministry of Labour figures are from the Ministry's AR's to 1965 and the HLS 1967; Mines Department figures are from BSMI's.
3) The conversion factor of 1.3 used in column iv is derived from a cost sheet supplied by a dredging company in Malaysia in 1970. On that sheet "supervision" costs were equivalent to an additional 30% of the wages bill. The figure of 1.2 for gravel pump mines is arbitrarily assumed at a lower value than for dredges. These coefficients compare well with the results of dividing CMinI wage bills (which include management and professional salaries) by wage bills derived from average wages from Ministry of Labour sources (which do not).

b) Calculation of the Average Wage

The main source of data are the AR's of the FM/WM Ministry of Labour. These give detailed breakdowns of wages for differnet occupational groups within each industry. For certain years the AR's are missing, probably not published. In such cases an average of the preceding and following years' wages is taken. If the gap is for more than a single year, the difference is spread between the preceding and following year evenly over the intervening period. The 1946 wage is assumed the same as that for 1947. At the time of writing (1970) the 1965 AR was the latest available. 1967 figures are for the HLS, 1967.

Set out below are calculations for a sample year (1965) for both dredging and gravel pumping. AR's give data in this form back to 1955, before which the layout is different and the degree of detail after somewhat less. For 1950, for which there is no AR wage rates are from Siew Nim Chee, "Labour and Tin Mining in Malaya", in T.H. Silcock (ed), Readings in Malayan Economics, op.cit. pp. 428-429.

Wages do not include free food and accommodation. These are calculated in Appendix IV - 9.

i) Calculation of Average Wage for Gravel Pump Tin Mining 1965

(i) TYPE OF WORKER		(ii) % OF LABOUR FORCE	(iii) AVERAGE MONTHLY EARNINGS $	(iv) ii x iii
Kepalas	D	2	297	594
Assistant Kepalas	D	5	195	975
Clerks	D	4	162	648
Cooks	D	3	109	327
Watchmen	D	5	112	560
Engine Drivers - Class 1 Certificate	D	1	186	186
	C	3	195	585
" - Class 2 Certificate	D	0.5	134	67
	C	1.5	140	210
" - No Certificate	D	1.25	99	123.75
	C	3.75	102	382.5
Chargemen - With Certificate	D	1.75	217	379.75
	C	0.25	200	50
" - No Certificate	D	4.375	96	420
	C	0.625	102	63.75
Excavator and Bulldozer Drivers	D	1.75	154	269.5
	C	0.25	160	40
Unskilled Men		40.8	116	4732.8
" Women		7.2	98	705.6
Pok Chau		2.6	260	676
" " Women		0.5	156	78
TOTAL		90.1		12075.65

$$\text{Mean Wage} = \frac{\sum \text{iv}}{\sum \text{ii}} = \$134.00$$

Sources and Notes: 1) Columns ii and iii from AR, Ministry of Labour, WM, 1965.
2) D = directly employed; C = employed through a labour contractor. The percentages in the AR's are not split between D and C. They are split here therefore according to the overall proportion of directly employed workers in gravel pump tin mining. Since the difference in earnings between D and C workers is usually small, such a simplification has little effect on the average wage obtained.

ii) Calculation of Average Wage for Tin Dredges, 1965

(i) TYPE OF WORKER	(ii) % OF LABOUR FORCE	(iii) AVERAGE MONTHLY EARNINGS $	(iv) ii x iii
Foremen	2	504	1008
Kepalas	4	206	824
Workshop Employees			
Skilled	8.52	257	2189.64
Semi-skilled	2.28	208	474.24
Unskilled	1.20	157	188.40
Outside Workers			
Drivers	3.30	221	729.30
Unskilled Men	17.16	144	2471.04
Unskilled Women	1.54	115	177.10
Dredge Crew			
Skilled	9.66	271	2617.86
Semi-skilled	5.06	177	895.62
Unskilled	31.28	138	4316.64
Apprentices	1	154	154.00
Lorry Drivers	1	169	169.00
Tin Ore Dressers			
Men D	0.8	163	130.40
" C	0.2	148	29.60
Women D	0.5	118	59.00
" C	1.5	85	127.50
TOTAL	91.0		16561.34

$$\text{Mean Wage} = \frac{\sum iv}{\sum ii} = \$181.99$$

Sources and Notes: 1) AR Ministry of Labour WM, 1965, for column iii. The AR gives percentages for Workshop, Outside and Dredge workers as groups but does not give percentages for skilled, semi-skilled and unskilled workers within these categories. Such a breakdown was obtained from the WM Ministry of Labour (private communication, March 1970) for 1967. A similar breakdown is given only in the 1955 AR. Changes in the proportions of workers within the main categories between 1955 and 1967 are assumed to have occurred at a constant annual rate in order to compute mean wages for other years (calculations will not be shown for this). AR's before 1955 do give a more detailed breakdown into skill groups, although the information is presented rather differently.
2) All dredge workers are employed directly unless otherwise stated.

APPENDIX IV - 9

LABOUR BENEFITS IN TIN MINING, 1946-68

	DREDGING		GRAVEL PUMP MINING		
	(i) MONTHLY VALUE OF FREE ACCOMMODATION ($)	(ii) ANNUAL TOTAL VALUE OF FREE ACCOMMODATION ($000)	(iii) ANNUAL TOTAL VALUE OF FREE ACCOMMODATION ($000)	(iv) MONTHLY VALUE OF FREE FOOD PER WORKER($)	(v) ANNUAL TOTAL VALUE OF FREE FOOD ($000)
1946	8.45	830	236	18	1362
47	8.45	1267	582	18	3355
48	8.45	1545	708	25.6	5794
49	8.6	1628	736	30.2	6837
1950	8.8	1661	491	35.0	5286
51	9.0	1672	768	39.5	8990
52	9.1	1625	751	44.0	9791
53	9.3	1505	577	48.6	8008
54	9.5	1605	649	43.8	8127
55	9.6	1664	666	39.0	5109
56	9.8	1684	913	37.0	8971
57	10.0	1820	718	37.0	6197
58	11.1	1273	368	37.0	3301
59	12.1	1248	424	37.0	3802
1960	13.2	1795	613	37.0	4550
61	14.2	1949	798	37.0	4595
62	15.3	2007	914	34.8	5535
63	16.4	2195	1057	32.6	5628
64	17.4	2577	1413	30.5	6631
65	18.3	3188	1933	30.7	8690
66	19.1	2472	2230	37.2	11646
67	20.0	2817	2325	40.2	12617
68	20.0	2573	2557	40.2	13704

Sources and Notes: 1) Annual Values = Monthly Values x 12 x Labour Force (as given in columns ii and vi of Appendix IV - 8), x % of Workers receiving benefits.
2) Monthly Values of Free Accommodation in Dredging - figures available for 1948, 1957, 1964, 1967. Intervening years figures are estimated as an average of the preceeding and following years, spread evenly over all intervening years. 1946 and 1947 assumed the same as 1948. 1948 and 1957 are from AR, Ministry of Labour, FM. 1964 is from Rubber Research Institute of Malaya, Guide to Estate Management, 1968, p. 30. Housing facilities on rubber estates and tin dredges are quite similar. 1967 is from Fourth Biennial Report 1965-7 National Mining Workers Union of Malaya. This report cites $23 a month as the housing allowance to be paid under the 1967 Agreement between the NMWUM and the Malayan Mining Employers Association. This figure is reduced to $20 for purposes of calculations since other figures reflect the value of accommodation in terms of its actual cost, rather than its opportunity cost in the open market. Normally all dredge workers have free accommodation. 1968 is assumed to be the same as 1967.
3) Monthly Values of Free Accommodation in Gravel Pump Mining - taken as 0.3 of the Dredge figure. Accommodation on Chinese gravel pump mines is of a very rudimentary form - wooden kongsi houses roofed with atap. It seems logical therefore that the monthly value should be lower. The figure of 0.3 was arrived at as follows, (figures from personal enquiries in Perak, November 1969).

Cost of kongsi house $15000
Number of men housed 30
House lasts 5 to 10 years

Monthly cost per worker if house cost is depreciated over 10 years: $4
over 5 years: $8
Cost of dredge housing: $20

Therefore cost is approximately a third of dredge housing cost.
4) Monthly Value of Free Food - figures from AR Ministry of Labour, for 1947, 1953, 1956, 1957, 1960. Calculated from CMinI 1964-7; and from Siew Nim Chee, op.cit., for 1950. Other years are estimated in same fashion as for accommodation. 80% of workers are assumed to receive free food unless another figure is available (57% in 1955, 77% in 1956, 70% in 1957, 81% in 1964 and 1967).

APPENDIX IV - 10

TIN MINING PURCHASES OF ELECTRICITY, 1946-67

	(i) TIN DREDGE ELECTRICITY CONSUMPTION ('000 UNITS)	(ii) "OPEN CAST" TIN MINES ELECTRICITY CONSUMPTION ('000 UNITS)	(iii) UNIT COST OF ELECTRICITY($)	(iv) DREDGE ELECTRICITY PURCHASES ($000)	(v) "OPEN CAST" MINING PURCHASES ($000)	(vi) GRAVEL PUMP MINING ELECTRICITY PURCHASES ($000)
1946	...	...	...	...	...	...
47	...	...	0.0313	...	...	...
48	...	...	0.0367	...	...	...
49	...	...	0.0360	...	...	...
1950	138,931	174,326	0.0362	5,029	6,319	6,115
51	154,680	189,568	0.0424	6,558	8,038	7,628
52	173,479	182,784	0.0476	8,258	8,701	8,300
53	170,643	194,612	0.0516	8,805	10,042	9,489
54	173,606	211,524	0.0476	8,263	10,069	9,495
55	188,470	246,441	0.0483	9,103	11,903	11,318
56	191,017	259,966	0.0498	9,513	12,946	12,259
57	211,341	266,191	0.0515	10,884	13,709	13,023
58	288,394	191,367	0.0483	13,929	9,388	8,805
59	*254,000	*208,000	0.0472	*12,000	* 9,800	* 9,200
1960	220,605	221,609	0.0547	12,067	12,122	11,515
61	277,720	271,032	0.0533	14,802	14,446	13,449
62	304,005	302,217	0.0533	16,203	16,108	14,754
63	302,348	321,476	0.0524	15,843	16,845	15,278
64	*318,000	*365,000	0.0521	*16,600	*19,000	*17,900
65	332,691	408,097	0.0523	17,400	21,343	20,254
66	333,420	488,814	0.0500	16,671	24,441	22,656
67	345,727	531,808	0.0500	17,286	26,590	25,181

Sources and Notes: 1) Column i and ii from AR's of Central Electricity Board, FM, 1950-63 AR's of National Electricity Board, WM, 1965-66 and 1967 from AR, Lembaga Letrik Negara 1967 Tenah Melayu (Central Electricity Board of Malaya). Asterisked items are estimates calculated as an average of the preceding and following years.

2) Column iii from BSMI to 31 December 1955, BSMI 1956-60, Annual BSMI's 1961-66.

3) Columns iv and v = i x iii, and ii x iii, respectively.

4) "Open Cast" mining (see headings of columns ii and v) has a different meaning in Electricity Board's publications from that used elsewhere. "Open Cast" here includes gravel pump mining. This is confirmed by photographs in some of the Board's AR's which show gravel pump mines over the caption "open cast mining".

5) Column vi is derived by multiplying column v by gravel pump output divided by the combined gravel pump and open cast (in Mines Department usage) outputs. These outputs are given in Appendix IV - 2.

6) Columns iv, v and vi show purchases of electricity from both government and most private commercial sources, e.g., the Perak River Hydro Electric Company's sales are included.

7) Purchases only are shown. In addition, many mines generate their own electricity. This is treated in this study as an intermediate product produced within the industry. The existence of this intermediate input would be reflected in purchases of fuels and/or equipment for electricity generation.

APPENDIX IV - 11 SMELTING AND TRANSPORT CHARGES, 1946-67

(All Tin Mining)

($000)	(i) TOTAL SMELTING CHARGES	(ii) RAILWAY RECEIPTS FROM TRANSPORT OF TIN ORE	(iii) RECEIPTS FOR TRANSPORT OF TIN ORE BY NON-RAIL TRANSPORT
1946	768	195	-
47	2462	419	38
48	4083	719	38
49	5029	884	38
1950	5263	920	64
51	5229	1031	57
52	5199	1176	32
53	5138	1136	48
54	5551	1188	78
55	5579	1200	62
56	5606	1269	217
57	5402	1232	181
58	5269	618	283
59	5126	777	245
1960	7100	1277	99
61	7653	1252	110
62	8005	1237	224
63	8189	1211	302
64	8197	1225	175
65	8697	1320	196
66	9410	1379	189
67	9852	1388	282

Sources and Notes: 1) Smelting Charges - derived by multiplying smelting charges per ton of ore by total tin output converted to an ore equivalent. Charges per ton were $103 for 1958-67, and a minimum of $68.6 for 1946-57. (From private communication from Straits Trading Company, April 1970). Conversion factors of metallic tin into ore: 1.32 for 1946-55, 1.326 for 1956, 1.328 for 1957, 1.326 for 1959-66. (From MBS, July 1969). Assay deductions have not been included in the table. Smelting charges levied by Eastern Smelting Company were not obtained, but in a competitive (oligopolistic) situation they could differ little from those of the STC. Yip Yat Hoong, "The Marketing of Tin Ore in Kampar", op.cit., quotes smelting charges for 74% ore of $5.20 a pikul ($84 a ton) in Kampar, Perak, with 1% assay deduction, for 1956. Unfortunately he gives no other years. Since the charges tend to stay constant for long periods and to rise in single discontinuous jumps, the usual practice of spreading changes evenly over time has not been adopted for the 1946-58 period, and the $68.6 figure has been used in preference to Yip's.

2) Railway receipts from tin - derived from AR's of Railway Administration Department MU/FM/WM, 1946-67. Non-rail transport charges per ton are assumed to be the same as for rail transport. Non-rail transport tonnage is derived by subtracting tin ore tonnage carried by railways for tin ore production figure.

3) For the purposes of Chapter IV, total smelting and transport charges can be allocated between types of tin mining in the same proportion as the proportion of total output produced by each type. There is no a priori reason to believe that smelting or transport charges per ton differ appreciably, if at all, between mining methods.

APPENDIX IV - 12

TIN MINING WAGES 1913-39

	(i) MONTHLY WAGE OF UNSKILLED WORKERS $	(ii) TOTAL ANNUAL DREDGING WAGE BILL (ALL WORKERS) ($000)	(iii) TOTAL ANNUAL NON-DREDGING WAGE BILL (ALL WORKERS) ($000)
1913	10.0	41	30,930
14	10.0	91	23,552
15	10.0	274	21,953
16	9.0	311	19,707
17	10.0	388	16,321
18	10.75	496	20,568
19	10.75	529	15,976
1920	12.5	640	10,003
21	8.75	883	9,493
22	10.0	934	10,350
23	11.25	1,135	13,771
24	11.25	1,333	15,106
25	11.25	1,538	15,079
26	18.75	3,057	24,809
27	12.5	2,502	18,756
28	12.5	3,198	15,894
29	12.5	3,784	14,605
1930	10.0	2,213	9,056

Sources and Notes: 1) To 1930, no wage data are available for tin mines. Column i is rubber tappers' daily wage x 25 (number of working days a month), from AR's, Labour Department, FMS, 1913-30. No wages data are available for before 1913. For the 1930's, when mining wage data are available, tappers' wage do compare roughly with those of unskilled mining labour. For the 1931-39 period, unskilled mining wages were 92% of tappers' wages on average with a standard deviation of 37.3% of the mean. Mining wages were higher in three of the nine years, lower in five, and the same in one.
2) To obtain the dredge wage bill, column i is multiplied by 12 x 1.5, the 1.5 being a conversion factor to take account of skilled workers wages and managerial salaries, 1.5 is obtained as follows: for 1946-67 the average ratio of skilled to unskilled workers wages in dredging is 1.25, and as described in Chapter IV, a conversion factor of 1.3 is then applied to take account of management salaries. No comparable figures are available for before 1946. Therefore 1.5 can be taken as a minimum ratio of average to unskilled dredge wages. (Of course, this ratio is much smaller than the ratio of average skilled to average unskilled wages, because in the overall average skilled wages carry only a small weight).
3) Column iii is derived as follows: the total tin mining labour force is taken as 96% of the total mining labour (as shown in Appendix IV - 3). The 96% figure is the approximate ratio of tin to total mining employment in the years for which tin employment figures are first available. Tin dredge labour force is deducted from the resulting figure, which is then multiplied by column i x 12 x 1.17. The conversion factor of 1.17 comprises 1.06 as ratio of skilled to average wages in gravel pump mines (from 1931-39 data) multiplied by a management salaries correction factor, taken arbitrarily as half the post war figure (of 1.2).

b) 1928-39 Wages and Labour Benefits

	DREDGING		GRAVEL PUMP MINING			
	(i) AVERAGE MONTHLY UNSKILLED EARNINGS($)	(ii) ANNUAL WAGE BILL ($000)	(iii) AVERAGE MONTHLY UNSKILLED EARNINGS($)	(iv) ANNUAL WAGE BILL ($000)	(v) MONTHLY VALUE OF FREE FOOD $	(vi) ANNUAL VALUE OF FREE FOOD ($000)
1928	12.5	3198	12.5	10,450	Included in	Included in
29	12.5	3784	12.5	10,379	Monthly	Annual Wage
1930	10.0	2213	10.0	5,767	Wages	Bill
31	7.5	1244	4.5	1,616	3	922
32	7.5	944	4.5	1,045	3	596
33	11.85	1473	8.75	2,165	4.1	867
34	14.65	2356	9.25	3,734	5.4	1864
35	14.65	2779	9.25	4,034	5.4	2013
36	14.65	4089	9.25	5,479	5.4	2734
37	24.0	6979	18.6	12,372	5.4	3070
38	12.9	3003	7.5	2,446	5.4	1506
39	19.15	5666	13.75	7,058	5.4	2369

Sources and Notes: 1)Average monthly earnings of unskilled workers in dredges assumed to be equal to gravel pump mine wages plus free food. Unskilled average daily wage rates are from AR's, Perak, 1931-39, monthly rates calculated on basis of 25 day working month. 1928-30 wages, and value of free food except for 1931, 1932 and 1939, are from section a of this Appendix. The same skilled labour and management salaries correction factors have been used as in section a, to correct the unskilled wage before multiplying by the employment figures (x 12) to derive an annual bill. Employment figures from Appendix IV - 3. 1931 and 1932 food cost estimated as follows: an adult male consumes approximately 8 gantangs (gallons, equal to about 8 lbs each) of rice a month, which at a rice price of 25 ¢ a gantang is $2. Thus, plus 50% for other food makes $3. 1939 food costs assumed same as for 1938.
2) Figures are taken from 1928 because this is the first year for which output statistics are broken down by mining method.

c) Tin Mining Wage Bill, 1931-39

	(i) TOTAL ANNUAL NON-DREDGING WAGE BILL ($000)	(ii) TOTAL ANNUAL WAGE BILL FOR ALL TIN MINING ($000)
1931	4,432	5,676
32	3,372	4,316
33	5,651	7,124
34	8,083	10,439
35	9,093	11,872
36	11,281	15,320
37	21,018	27,997
38	6,370	9,373
39	12,666	18,332

Sources and Notes: 1) Column i calculated by multiplying Gravel Pump Wage Bill (Column iv of part b of this Appendix) by total non-dredge employment in tin (from Appendix IV - 3) divided by gravel pump employment (from Appendix IV - 3).
2) Column ii is column i + column ii of part b of this Appendix.

APPENDIX IV - 13

MINING CONSUMPTION OF FUEL 1910-39

a) Coal

	(i) TOTAL MINING CONSUMPTION COAL(TONS)	(ii) CONSUMPTION OF LOCAL COAL(TONS)	(iii) LOCAL COAL PRICE PER TON EX-PITHEAD	(iv) ANNUAL VALUE OF LOCAL COAL CONSUMPTION ($000)	(v) FOREIGN COAL CONSUMPTION TONS	(vi) FOREIGN COAL UNIT VALUE $	(vii) ANNUAL VALUE OF FOREIGN COAL CONSUMPTION ($000)
1910	...	-	-	-	...	...	...
11	44,607	-	-	-			
12	53,365	-	-	-			
13	35,795	-	-	-			
14	37,434	-	-	-			
15	40,528	*10,000	4.94	49	30,528	15.9	487
16	72,952	*35,000	4.73	167	37,952	21.9	833
17	62,044	*45,000	5.37	242	17,044	64.7	1,103
18	62,290	66,500	6.93	461	-	79.8	-
19	88,839	87,060	6.75	588	1,779	64.5	115
1920	102,270	115,041	8.63	993	-	43.4	-
21	105,724	92,728	8.91	826	12,996	25.3	329
22	103,916	72,678	7.87	572	31,238	22.3	698
23	146,545	100,846	7.42	748	45,699	18.3	836
24	167,378	145,969	7.23	1,055	21,409	13.3	285
25	194,995	174,011	7.26	1,263	20,984	21.6	453
26	204,419	210,732	7.28	1,524	-	11.8	-
27	287,508	241,139	6.74	1,625	46,369	10.9	503
28	305,099	285,065	6.29	1,793	20,034	10.5	211
29	303,827	297,486	5.90	1,755	6,341	13.5	85
1930	236,110	213,288	5.77	1,231	22,822	10.3	234
31	158,285	156,942	5.77	906	1,343	8.9	12
32	76,268	73,359	5.61	412	2,909	8.2	24
33	41,277	47,566	5.53	263	-	7.8	-
34	81,101	82,505	4.81	397	-	7.7	-
35	128,599	103,681	4.88	506	24,918	7.6	189
36	...	170,708	4.98	850	...	7.2	...
37	399,117	187,313	6.37	1,206	149,804	8.8	1,326
38	165,733	133,453	6.75	901	32,280	10.1	327
39	...	124,819	5.51	688	...	10.2	...

Sources and Notes: 1) Columns i and ii from AR's Mines Department, FMS, 1911-39; column iii from BSMI to 31 December 1955; column v = i - ii; column vi derived by dividing value of coal imports by their tonnage from British Malaya, Imports and Exports (annual) 1930-39, and AR's of Trade and Customs Department, FMS, 1915-29.

2) Local coal consumption estimated for 1915-17 on basis of the proportion of mining consumption to local coal production (1/3). Production figures not shown here.

b) Diesel Oil and Wood Fuel, 1913-39

	(i) TOTAL CONSUMPTION OF DIESEL OIL BY MINES (TONS)	(ii) DIESEL UNIT VALUE $	(iii) TOTAL VALUE OF DIESEL CONSUMPTION ($000)	(iv) TOTAL CONSUMPTION OF WOOD FUEL BY MINES (TONS)	(v) WOOD FUEL UNIT VALUE $	(vi) TOTAL VALUE OF WOOD FUEL CONSUMPTION ($000)
1913	1,481	...	...	303,500	3.0	910
14	1,640	...	...	439,800	3.0	1,320
15	3,727	...	...	495,628	3.0	1,486
16	3,107	...	...	645,280	2.8	1,806
17	2,538	...	...	646,285	3.2	2,068
18	3,488	...	...	741,357	4.2	3,114
19	3,397	...	...	798,363	4.0	3,194
1920	2,702	...	...	769,990	5.2	4,004
21	2,577	...	...	713,183	5.4	3,872
22	2,640	...	...	701,137	4.8	3,366
23	4,576	...	...	791,015	4.4	3,480
24	8,070	...	...	951,042	4.4	4,184
25	20,860	58.0	1,210	1,380,012	4.4	6,072
26	32,325	49.1	1,587	928,456	4.4	4,084
27	53,875	47.7	2,570	852,148	4.0	3,408
28	66,100	49.5	3,272	581,775	3.8	2,210
29	73,356	50.3	3,690	541,849	3.6	1,950
1930	69,396	46.3	3,224	556,752	3.4	1,212
31	47,781	38.3	1,830	249,473	3.4	848
32	27,741	39.2	1,087	163,655	3.4	556
33	22,024	37.3	821	131,561	3.4	448
34	31,121	36.1	1,123	173,314	2.8	486
35	39,219	34.8	1,365	172,166	3.0	316
36	...	35.7	...	*195,710	3.0	*587
37	107,659	38.2	4,113	219,255	3.8	834
38	76,425	37	2,828	160,068	4.0	640
39	...	...	...	*160,068	3.4	*544

Sources and Notes: 1) Diesel consumption from AR's, Mines Department, 1913-39. Diesel Unit Values from British Malaya, Imports and Exports, 1930-39 and 1925-29 from AR Trade and Customs Department, FMS, 1929. No attempt made to estimate consumption for 1936 and 1939, because of great variability in other years.
2) Total firewood consumption from AR's, Mines Department 1913-39. This series is especially suspect and the Mines Department suggests they are only very rough estimates. The price of firewood (excluding transport charges to mine) is also only a very rough estimate. It is calculated as 0.6 of the local price of coal on the basis that the FMS Railways Department (1935 AR) calculates that one ton of jungle wood is equal in calorific value to 3/15 (≏.6) of a ton local coal. Estimate for 1936 is an average of preceding and following year, and 1939 is assumed same as 1938.

c) Electricity 1928-39

	(i) SALES BY PERAK RIVER HYDRO-ELECTRIC COMPANY (000 UNITS)	(ii)	(iii)	(iv) SALES BY SELANGOR GOVERNMENT (000) UNITS)	(v)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)
	TO DREDGES	TO 'OPEN CAST' MINES	ALL MINING SALES	TO DREDGES	TO 'OPEN CAST' MINES	ALL MINING SALES	TOTAL ALL MINING PURCHASES	TOTAL ALL MINING CONSUMPTION (000 UNITS)	PRICE OF ELECTRICITY PER UNIT $	TOTAL VALUE OF DREDGE PURCHASES ($000)	TOTAL VALUE OF 'OPEN CAST' MINING PURCHASES ($000)	TOTAL VALUE OF ALL MINING PURCHASES ($000)
1928	...	...	27,520	...	...	7,620	35,140	106,478	.0275	....	...	966
29	...	...	31,698	...	...	12,825	44,523	165,445	.0275	...	...	1,224
1930	...	...	53,231	...	...	12,248	65,479	...	.0265	...	...	1,719
31	...	...	...	...	...	...	...	...	.0265	...	...	...
32	...	...	...	...	...	...	...	...	.0265	...	...	...
33	...	...	...	...	...	...	...	...	.0265	...	...	...
34	...	...	...	...	...	...	...	...	*.0265	...	...	...
35	...	...	...	...	...	...	...	194,653	*.0265	...	...	...
36	66,301	131,052	197,353	...	...	61,800	259,153	344,050	*.0265	...	...	...
37	74,935	166,514	241,449	15,595	41,364	56,959	298,408	467,171	*.0265	2,376	5,457	7,833
38	...	...	148,511	11,957	25,560	37,517	186,028	266,773	*.0265	...	...	4,883
39	...	...	108,920	...	...	*40,000	*150,000	...	*.0265	...	...	*3,937

Sources and Notes: 1) Column ix from Manual of Statistics, FMS, 1928-33. The 1934-36 Manuals were not available, and the 1937-9 issues did not give electricity rates. The 1934-39 rates are assumed not to have altered - this gives a minimum value of electricity purchases.

2) All 1928-30 figures except column viii are from AR's, Mines Department, FMS, 1928-30.

3) Columns i to iii from AR's, Perak, 1936-39. Columns iv to vi from AR's Electricity Department, FMS, 1936-38. 1939 figures column vi is estimated on the basis of a large increase mentioned in the 1939 AR of the Electricity Department.

4) Column viii from AR's Chief Secretary, FMS, 1936-8. Consumption of electricity differs from Purchases mainly by the extent of self-generated electricity. It can be seen how the proportion of Purchases rose over time.

5) Perak and Selangor are the main tin mining areas. There was little or no generation of electricity for mines by the government in Perak, or by private firms in Selangor.

APPENDIX IV - 14 SMELTING AND TRANSPORT CHARGES 1913-39

	(i) RAILWAY RECEIPTS FROM TRANSPORT OF TIN ORE($000)	(ii) NON-RAILWAY RECEIPTS FOR TRANSPORT OF TIN ORE ($000)	(iii) RAIL CHARGES ON COAL, COKE AND FIREWOOD $ PER TON	(iv) RAIL RECEIPTS FOR TRANSPORT OF FUEL TO MINES ($000)	(v) LOCAL CHARGES $ PER TON	(vi) TOTAL SMELTING CHARGES ($000)
1913	...	...	*1.2	*411	43.68	3043
14	...	...	*1.2	*577	50.57	3447
15	...	...	*1.2	*652	38.64	2511
16	220	2	1.2	869	35.28	1931
17	*202	3	1.2	856	74.42	3914
18	195	4	1.2	978	78.62	3885
19	199	5	1.2	1073	58.63	2806
1920	193	1	1.3	1141	65.13	2971
21	237	14	1.7	1407	61.82	2713
22	223	10	1.7	1378	62.83	2838
23	231	18	1.6	1515	74.59	3655
24	355	13	1.9	2156	49.22	2746
25	387	25	1.9	2999	47.04	2591
26	329	17	1.9	2275	33.77	1811
27	365	12	1.9	2370	35.45	2194
28	422	9	2.0	2037	29.90	2143
29	449	9	2.1	2084	23.02	1688
1930	409	9	2.2	1669	39.65	3002
31	332	2	2.1	1057	34.10	2735
32	180	-	2.0	591	23.52	703
33	227	3	1.9	413	12.77	654
34	157	-	2.1	660	...	...
35	264	-	2.1	797	...	...
36	439	-	2.4	a/a	...	...
37	585	-	2.7	2089	...	...
38	339	-	2.3	1101	...	...
39	413	-	2.2	-	...	...

Sources and Notes: 1) Columns i and iii from AR's, Railway Department, FMS, 1913-39.
2) Column ii derived from multiplying the rail charges per ton (assumed equal to the charges for road and other transport) by the difference between total exports and tons carried by rail.
3) Column iv calculated by multiplying total tonnage of coal, firewood and diesel carried by column ii (except that for diesel which requires more elaborate transport facilities, the charge per ton is doubled). The tonnage figures are in Appendix IV - 13. This is an important item since local coal prices are quoted ex-pithead and imported coal and diesel are prices c.i.f. at a port of entry.
4) Local charges from AR's Mines Department, 1913-33. They represent charges levied by the smelter for smelting handling, and transport (normally paid for by smelter). Column vi derived by multiplying total exports of ore by column v and subtracting transport charges (i + ii).

APPENDIX IV - 15

TIN RESTRICTION

A number of attempts have been made to support the world price of tin since the First World War.

Beginning in 1921 after a sharp fall in the world price Malaya and the Netherlands East Indies - the so-called Bandoeng Pool - withheld a total of 19,000 tons of tin from the market, which amount they held until 1923 and subsequently sold at a profit.[1]

Following falls in the tin price in the late 1920's a voluntary Tin Producers Association was formed in 1929, controlling 20% of world output, to restrict production on a voluntary basis. Yip notes the failure of this scheme as stocks continued to accumulate and prices decline.[2]

A wider scheme of control was agreed from February 1931 between Malaya, the Netherlands East Indies, Bolivia and Nigeria. A standard tonnage was agreed for each country based on its share of 1929 world output. Export quotas were determined on the basis of these standard tonnages. A second agreement was set up in 1934 and extended in 1937 so that control continued throughout the pre-1940 period. In 1938 as part of the scheme, a buffer stock was set up to control price fluctuations.[3]

Control has been in existence several times since the Second World War. In 1953 the first International Tin Agreement was concluded (with effect from 1956) following price falls due to the end of United States Strategic Stockpiling. A second Agreement was signed from 1962, and a third from 1966, for five years. Export quotas are introduced only if the amount of tin held by the buffer stock exceeds a specified amount.[4] A period of export control started from September 1968, making the second period of control in the post war period. The first was from 1958 to 1960.

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[1] Yip Yat Hoong "Post-War International Tin Control, with Special Reference to Malaysia", Kajian Ekonomi Malaysia, December, 1964, p. 51.

[2] Ibid., p. 52.

[3] This account is based on J.K. Eastham, "Rationalisation in the Tin Industry", Review of Economic Studies, 1936, reprinted in T.H. Silcock, Readings in Malayan Economics, op.cit.; and M.A.G. van Meerhaeghe, International Economic Institutions (London, 1966), pp. 212-223.

[4] Meerhaeghe, op.cit.

The table below shows average domestic quota releases for the FMS 1931-39 as percentages of the standard tonnage, and post war percentage release figures for 1958-60.

YEAR	% RELEASE	YEAR	% RELEASE
1931	66.33	1958	58.8
32	32.77	59	61.9
33	24.33	60	92.7
34	32.83		
35	42.35		
36	67.00		
37	77.75		
38	41.22		
39	53.00		

Sources and Notes: 1) 1931-39 figures from AR Mines Department, FMS, 1939. The percentage figures refer to the amount of the FMS's "standard tonnage" that it was allowed to export. 2) Postwar figures from Meerhaeghe, op.cit., p. 217. Meerhaeghe gives figures for total tonnage releases for all members combined. Malaysia was allowed 37.5% of the total international tonnage. We take the 1957 Malayan output as a norm, and calculate the amounts which Malaya was allowed to export in 1958-60 as percentages of this figure. This is a crude method, but it gives the direction of changes in restriction.

APPENDIX IV - 16 ELASTICITIES OF SUBSTITUTION IN TIN MINING

In Subsection IV - 3v an attempt is made to calculate production functions for gravel pump mining and tin dredging for the 1947-66 period in West Malaysia. The production function chosen is the Cobb-Douglas type. Cobb-Douglas production functions assume that the elasticity of substitution between the inputs is unity.[1] If it is not unity, the "SMAC" production function mentioned in the text would be a more appropriate function to estimate. In this appendix a simple attempt is made to estimate the elasticity of substitution in the two tin sectors for the 1947-66 period.

Elasticity of substitution is defined as the proportionate change in factor proportions over the proportionate change in relative factor prices.[2] Thus:

$$1)\quad ES = \frac{\dfrac{d\left(\dfrac{x_1}{x_2}\right)}{\dfrac{x_1}{x_2}}}{\dfrac{d\left(\dfrac{p_1}{p_2}\right)}{\dfrac{p_1}{p_2}}}$$

where x_1 and x_2 are inputs, and p_1 and p_2 are prices of inputs.

Let $y = \dfrac{x_1}{x_2}$ and $x = \dfrac{p_1}{p_2}$

By writing a function in exponential form:

2) $y = ax^b$, which becomes a log-linear form:

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[1] Walters, "Production and Cost Functions", op.cit., p. 6.

[2] G.C. Archibald and R.G. Lipsey, An Introduction to a Mathematical Treatment of Economics (London, 1967) p. 266.

2a) $\log y = \log a + b \log x$,

the elasticity of substitution - which is the b coefficient - can be estimated directly.

In Subsection IV - 3v the two inputs are labour and power services. The price of labour is taken to be the average wage paid by each sector. A proxy for the price of power services raises more difficulty. The price of high speed diesel oil has been chosen as the power price in gravel pumping, and the price of electricity for dredging.[1] Data are not available to calculate a more sophisticated price index using, say, the prices of capital goods as well as fuel.

Results of the calculation are shown in Table 1 where the factor use ratio is regressed on the factor price ratio for 1947-66. First differences of the function were also calculated to eliminate possible serial correlation. The relevant equations are the first difference version for gravel pumping and the equation using the original data in the case of dredging. The equation using original data for gravel pumping is subject to such serious positive serial correlation that its standard errors (and hence the significance of the b coefficient) are completely unreliable. The first difference dredging equation gives a positive elasticity of substitution, whose value is not significantly different from zero at even the 20% level.[2]

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[1] In gravel pump mining in 1968 diesel oil (mostly high speed) was 43% of all materials purchases and 57% of all fuel purchases. The analagous figures in dredging were 79% and 91%. See CMinI 1968.

[2] The meaning of this and other statistical terms is explained in the text in Subsection IV - 3v.

APPENDIX IV - 16 TABLE 1

CALCULATION OF ELASTICITY OF SUBSTITUTION IN GRAVEL PUMPING AND DREDGING, 1947-66.

			a	b	r^2	DW
Gravel Pump Mining (Original data)	y'_t	=	6.28768* (3.49016)	$-1.70414^{*}x'_t$ (-4.84733)	0.56623	0.57413
(First differences)	$y'_t - y'_{t-1}$	=	-0.05004 (-0.98651)	$-0.86669^{*}x'_t - x'_{t-1}$ (-2.32088)	0.24061	2.62073
Dredging (Original data)	y'_t	+	7.81803* (4.89359)	$-1.25163^{*}x'_t$ (-6.17106)	0.67904	1.30137
(First differences)	$y'_t - y'_{t-1}$	=	-0.05465* (-2.42919)	$+0.03163\ x'_t - x'_{t-1}$ (0.20313)	0.25825	2.78951

Sources and Notes: 1) y is employment of labour divided by employment of horse power. x is the wage rate divided by the price of power. y' is log y, and so on. The t subscripts indicate time in years.
2) Employment and power statistics from Appendices IV - 3 and IV - 5 respectively. Wages from Appendix IV - 8. Power prices (of high speed diesel oil in the case of gravel pumping, and of electricity for dredging) are from BSMI's 1945-55, 1955-60, and 1960-66.
3) Student t statistics shown in brackets under the values of the coefficients.
4) Starred coefficients are those which are significant at the 5% level.

The elasticity of substitution in gravel pumping is calculated as (-) 0.86669, although the fit of the regression equation (indicated by r^2) is poor. It can be shown that this value is not significantly different from unity, at the 5% level.[1] The elasticity of substitution in dredging is (-) 1.25163. This value appears to be significantly different from unity at the 5% level, but the possibility of negative serial correlation (indicated by the value of 4-DW) suggests that the standard error term (not shown in Table 1) is artificially low. A larger standard error could remove the significance of the difference from unity. Moreover, since the method of calculation is in any case crude, a value of (-) 1.25 is sufficiently near to unity to justify use of the Cobb-Douglas form.

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[1] In the same way as the Student t statistic can be used to estimate whether the regression coefficient is significantly different from zero, it can also be used to estimate the significance of differences from unity. Thus:

$$t_{calc.} = \frac{/b/ - 1}{\text{Standard error}}.$$

If $t_{calc.}$ is less than t at the 5% level with 17 (i.e. 19-2) degrees of freedom (i.e. $t_{.05} = 2.110$) the b coefficient is not significantly different from zero.

For dredging $t_{calc.} = 12.40657$ ($> t_{.05}$)

For gravel pumping $t_{calc.} = 0.379195$ ($< t_{.05}$).

APPENDIX V - 1

MALAYAN RUBBER ESTATE OUTPUT, 1906-68

	ESTATE OUTPUT, FMS (TONS)		ESTATE OUTPUT, WEST MALAYSIA (TONS)
1906	385	1946	...
07	889	47	359,865
08	1,425	48	402,907
09	2,716	49	400,009
1910	5,632	1950	375,853
11	9,736	51	327,956
12	14,193	52	341,078
13	20,226	53	341,117
14	26,100	54	344,851
15	36,859	55	351,802
16	...	56	350,805
17	...	57	367,909
18	...	58	389,409
19	...	59	407,170
1920	107,557	1960	413,195
21	...	61	428,153
22	...	62	438,261
23	66,685	63	458,304
24	54,077	64	476,841
25	65,158	65	490,944
26	112,547	66	593,855
27	92,289	67	525,779
28	100,233	68	563,041
29	144,578		
1930	140,789		
31	141,457		
32	140,525		
33	137,363		
34	147,417		
35	133,067		
36	125,005		
37	166,255		
38	129,728		
39	...		

Sources and Notes: 1) 1906-15 figures from AR's, Department of Agriculture FMS, 1911-1915; 1923-25 and 1931-38 from AR's Chief Secretary FMS 1923-25 and 1931-38; 1926 from AR, Rubber Restriction Department 1926; 1927-29 from RSH 1930.

2) 1947-66 figures from Thomas and Fong, Rubber Industry Statistics, op.cit., p. 1
1967-8 from RSH 1967 and 1968.

3) 1920 output is the 'standard tonnage' figure for estates for the first year of rubber restriction, apparently based on the 1920 output (a figure which is not otherwise obtainable). From AR, Department of Agriculture FMS, 1924.

APPENDIX V - 2

RUBBER ESTATE EMPLOYMENT, 1910-68

	FMS ESTATES		WEST MALAYSIAN ESTATES
1910	128,446	1946	332,300
11	166,015	47	289,200
12	188,050	48	287,000
13	201,207	49	275,000
14	...	1950	281,600
15	180,395	51	282,800
16	196,123	52	280,000
17	220,788	53	281,390
18	201,862	54	267,981
19	237,128	55	278,200
1920	216,588	56	280,200
21	156,341	57	276,740
22	167,259	58	281,900
23	163,105	59	282,510
24	159,357	1960	285,300
25	184,354	61	285,560
26	246,760	62	286,220
27	225,218	63	286,320
28	223,044	64	275,410
29	258,780	65	270,160
1930	170,620	66	249,500
31	142,484	67	231,900
32	126,235	68	206,680
33	123,924		
34	161,408		
35	145,899		
36	153,455		
37	199,119		
38	170,932		
39	174,084		

Sources and Notes: 1) 1911-13, 1915 from AR's Department of Agriculture, FMS 1911-15; 1916-30 from AR'S Resident General/Chief Secretary, FMS, 1916-30; 1931-32 from AR's Labour Department, 1931-32; and 1933-39 from RSH 1933-39.
2) 1946-63 from AR's Labour Department/Ministry of Labour, MU/FM/WM, except for years where figure is given to nearest hundred, which are from Thomas and Fong, op.cit., p. 36.
3) Figures to 1932 include a small number of workers on estates other than rubber estates.

APPENDIX V - 3 RUBBER PRICES AND NET EXPORT UNIT VALUES, 1905-68

	(i) RSS1 PRICE (SINGAPORE) (CENTS PER LB)	(ii) NET EXPORT UNIT VALUE (CENTS PER LB)		(i) CONT'D	(ii) CONT'D
1905	...	227.1	1946	...	...
06	...	180.3	47	37.3	37.5
07	...	191.5	48	42.1	42.3
08	...	145.1	49	38.2	37.5
09	...	239.2	1950	108.2	108.1
1910	...	315.6	51	169.5	167.9
11	...	202.8	52	96.1	95.4
12	...	180.2	53	67.4	67.7
13	...	106.7	54	67.3	60.7
14	...	79.3	55	114.2	108.7
15	...	73.6	56	96.8	96.5
16	...	105.0	57	88.7	90.2
17	...	105.7	58	80.2	79.1
18	64.3	66.3	59	101.6	99.4
19	80.7	79.3	1960	108.1	108.4
1920	75.7	78.7	61	83.5	82.9
21	31.1	31.9	62	78.2	78.5
22	28.8	25.9	63	72.4	73.6
23	51.2	50.2	64	68.1	69.1
24	49.0	46.7	65	70.0	69.4
25	114.0	103.5	66	65.4	66.9
26	80.5	83.1	67	54.1	56.5
27	64.3	64.6	68	53.1	53.2
28	36.8	33.5			
29	34.6	34.2			
1930	19.1	19.3			
31	9.8	11.3			
32	7.0	7.9			
33	10.2	10.1			
34	20.6	25.7			
35	20.2	20.5			
36	27.0	26.4			
37	32.1	32.5			
38	24.1	23.9			
39	31.0	31.0			

Sources and Notes: 1) Prices 1918-21 calculated from monthly averages in AR's Department of Agriculture FMS, 1918-21. 1922-25 from AR Department of Agriculture, FMS 1922-25. 1926-66 from Thomas and Fong, op.cit., p. 25. 1967-68 from MBS June 1970.
2) Export units values refer to FMS to 1930 and are from calculated data in AR's Resident General/Chief Secretary, FMS 1905-15, and AR's Trade and Customs Department FMS 1916-30. FMS net export figures are not available from 1930. 1931-39 figures refer to British Malaya and are from Department of Agriculture, FM, Malayan Agricultural Statistics 1949 by R.G. Heath. 1947-68 figures for West Malaysia are from Thomas and Fong, op.cit., p. 32. 1967-8 from MBS June 1970.

APPENDIX V - 4

CALCULATION OF ESTATE OUTPUT UNIT VALUES

Estate Output unit values used in Tables in the text for the period 1946-68 are equal to net export unit values (from Appendix V - 3) plus one cent per pound. This is arrived at as follows:

	(i) 1968 PRICE	(ii) WEIGHT (PROPORTIONS OF TOTAL OUTPUT)	(iii) i x ii
Smallholders			
RSS 1 and 2	52.57	0.26	13.67
3	51.30	0.45	23.08
RSS 4 and lower grades	47.15	0.29	8.96
	Unit Value of Smallholder output		50.42
Estates			
Latex concentrate	60.0	0.13	7.80
RSS 1	53.12	0.72	38.24
Lower grades	47.15	0.15	7.07
	Unit Value of Estate output		53.11

	(i) 1968 OUTPUT (MIL. TONS)	(ii) UNIT VALUE	(iii) i x ii
Smallholder unit value	563	50.42	28,386
Estate unit value	472	53.11	25,068
Totals	1,035	-	53,454

Overall unit value $= \dfrac{\sum iii}{\sum i} = 51.64$

Thus, estate unit value less overall unit value = 1.47 cents. Since the estimates of the proportion of RSS 1 in estate output are based on best rather than average practice, the excess of estate over overall unit value is taken to be one cent per pound. Note that over the post-1946 period there is a close correspondence between export unit values and RSS 1 price. Average export unit values in Appendix V - 3 for 1947-68 are 0.997 of the average RSS 1 price.

For the period to 1939 output unit values for estates have been assumed to be the same as overall net export unit values. In the pre-war period latex concentrates manufacture was less important than post-war, and it is the manufacture of latex concentrates, with its high premium over the RSS 1 price, which primarily accounts for the post-war differential in estates over overall export unit values.

APPENDIX V - 4 (continued)

Sources and Notes: 1) Proportions of smallholder output from D.W. Fryer and J.C. Jackson, 'Peasant Producers or Urban Planters? The Chinese Rubber Smallholders of Ulu Selangor', op.cit., p. 225. Estate figures assume most latex concentrate is produced by estates (latex concentrate was 14.3% of West Malaysian 1968 rubber exports by weight, and a higher proportion by value - RSH 1968), and that 15% of output is of lower grades. According to the RRIM, Estate Management Handbook, 1968 op.cit., p. 14 90% of an RSS estate crop can be processed into RSS 1, SMR rubber is excluded as being unimportant for the post-war period as a whole.
2) Prices from RSH 1968 except for latex concentrate. the premium for which is estimated from an interview in Malaysia with a latex concentrate manufacturer, December 1969. The absolute price differentials between grades change little with the level of rubber prices, except for the latex concentrate premium which tends to move independently of the RSS price.
3) Output figures from RSH 1968.

APPENDIX V - 5 SHAREHOLDINGS IN UK-INCORPORATED RUBBER PLANTING COMPANIES

Local shareholdings in rubber companies incorporated in Malaysia are given in the 1967 Survey of Limited Companies published by the Malaysian Department of Statistics. In order to find the proportion of Malaysian shareholdings in UK-incorporated companies, questionnaires were sent, in March and April 1971, to all Secretaries of rubber planting companies operating in Malaysia whose shares were quoted on the London Stock Exchange. The list of Secretaries was taken from the 1969 edition of Zorn and Leigh-Hunt, Manual of Rubber Planting Companies. Replies were received from 20 of the 27 Secretaries, in several cases after followup letters had been sent assuring the companies that their information would be kept confidential.

Of the replies received three indicated that the company (or companies) concerned had sold their rubber interests and had become investment companies, two were in liquidation, and two were unable to provide the information requested. The 13 positive replies covering 31 companies[1] indicated very low Malaysian shareholdings. Only 7 companies had more than 6% of their shares owned by Malaysians. These had from 8% to 61% of their shareholding in Malaysian hands.

In order to arrive at an average shareholding, individual companies' shareholdings were weighted by the current value of their issued capital. Current share values were used in preference to par value because the former give a clearer indication of recent and expected profitability. Current share prices were obtained from the Financial Times (of London). For 13 of the companies no current share price was available, presumably because no trading in the particular share had occurred recently. In these cases share prices were taken from the 1969 Zorn and Leigh-Hunt. It was found that the 1971 share price of companies quoted in the Financial Times was in almost all cases very near to the 1968 higher share price (a highest and a lowest price were quoted) in Zorn and Leigh-Hunt. Thus the 1968 high share price was used in the calculation. For two very small companies (each with annual output below a million pounds of rubber) no share prices were given in Zorn and Leigh-Hunt, so these companies' issued capital was weighted by the par value of their shares. The calculation is of exactly the same form as that used for tin-dredging companies and set out in Appendix IV - 7. No calculations are shown here for rubber companies

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[1] Generally Secretaries act for several companies.

APPENDIX V - 5 (Continued)

because several companies gave information on the strict condition that their individual shareholdings should not be shown. Since it would be possible to recognize companies from their issued capital and share prices even if names are not given, no worksheet can be shown which would effectively disguise companies' identities.

The results of the survey were as follows. The 31 companies had a mean Malaysian shareholding of 0.0668 (i.e. 6.68%), with standard deviation of 0.1490. Confidence intervals, using Student t distribution, at the 5% level of significance indicated a possible range of Malaysian shareholdings from 1.22% to 12.14%. Since the sample represented a large proportion (exactly half) of all UK-registered rubber companies, a finite population correction factor (FPCF) was applied, reducing the confidence limits to a range of 2.78% to 10.57%.

It is also possible to argue that the size of the sample relative to the population of rubber companies should be seen in terms other than the number of companies. The 31 companies in the sample had a total issued share capital currently valued at £96.8m., in relation to the current value of issued capital of all Zorn and Leigh-Hunt Malaysian rubber companies (i.e. all rubber companies operating in Malaysia with shares quoted on London Stock Exchange) of £123.4m. Also, the output of the sample companies in 1968 was $200.8m. compared to $307.4m. for all Zorn and Leigh-Hunt companies. This information cannot properly be used in a FPCF, but it is a further indication of the large size of the sample relative to the total population of companies.

Of course, such confidence intervals must be treated in any case with extreme caution, since the "randomness" of the sample depends on the pattern of self-selection of the respondents. However, unless the pattern of non-response shows some particular bias,[1] the confidence intervals may be better shown than not.

Several other points of caution need to be made. First, part of the Malaysian holdings may be in the hands of nominee companies which themselves have small local shareholdings. Two large companies mentioned this problem. One suggested that most of its Malaysian held shares were owned by institutional nominees and therefore the true Malaysian holdings (i.e. holdings

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[1] For instance, companies might fail to respond if they thought there were political disadvantages to having low local shareholdings. Since most respondents indicated low local shareholdings the sample would not be biased by the exclusion of others with similar characteristics.

APPENDIX V - 5 (Continued)

in the hands of private Malaysian residents or companies which themselves had a predominant Malaysian shareholding) were small. Another suggested that most of its (large) Malaysian holding was in the hands of private individuals. Second, local shareholding include holdings of resident expatriates. Third, in some cases 'Malaysian' holdings quoted refer to residents of both Malaysia and Singapore. These are all factors which would tend to overstate local shareholding. Since average local shareholdings are found to have been low anyway, the fact that this low proportion may be overstated is less important than if the proportion were high. On the other hand, the local holding may be understated to the extent that Malaysians purchase shares on the London Stock Exchange and thus are not included on companies' Malaysian share registers.

APPENDIX V - 6 RUBBER ESTATE WAGES

a) Wages 1946-68, West Malaysia

	(i) AVERAGE MONTHLY WAGE ($)	(ii) EMPLOYMENT	(iii) ANNUAL WAGE BILL (i x ii x 12) ($000)	(iv) ANNUAL WAGE BILL INCLUDING MANAGEMENT AND PROFESSIONAL SALARIES (iii x 1.2)
1946	...	332,300	...	...
47	61.12	289,200	212,111	254,533
48	52.58	287,000	181,085	217,303
49	44.24	257,800	146,417	175,700
1950	...	281,600	...	...
51	*85.80	282,800	291,171	349,405
52	*74.10	280,000	248,976	298,771
53	62.77	281,390	211,954	254,345
54	64.35	267,981	206,935	248,322
55	70.50	278,200	235,357	282,429
56	75.88	280,200	255,139	306,167
57	78.77	276,740	261,586	313,903
58	*78.00	281,900	263,858	316,635
59	78.74	282,510	266,938	320,326
1960	92.24	285,300	315,793	378,951
61	80.48	285,560	275,782	330,939
62	83.39	286,220	286,402	343,683
63	79.02	286,320	271,517	325,820
64	88.35	275,410	291,990	350,388
65	85.88	270,160	277,444	332,933
66	91.95	249,500	275,308	330,370
67	92.89	231,900	258,476	310,171
68	97.68	206,680	242,262	290,714

Sources and Notes: 1) Wages to 1961 are calculated from (see part b of this Appendix) AR's of Ministry of Labour/Labour Department of WM/FM to 1961. 1962 and 1963 wages are calculated from column iv wage bill from(RSH 1962 and 1963.) The 1962 and 1963 RSH wage bills are given for December only, and have been prorated with the average total wage bill ÷ December wage bill from RSH's 1964-68 in order to arrive at an annual total.

2) Employment figures are also from AR's of Ministry of Labour/Labour Department. Employment in years for which AR's not available is from Thomas and Fong, op.cit., p. 36.

3) The conversion factor of 1.2 in column ii takes account of the fact that management salaries are not included in the average wage computations. In the 1964 RRIM Survey of Estates, op.cit, data from which are given in Table V - 19 of the text, (Labour Costs + Management Costs) ÷ (Labour Costs) = 1.19, say 1.2. As Table V - 26 of the text shows, this conversion factor gives wage bills which agree closely with those of the RSH.

4) Estimates (asterisked) for years for which data are missing are calculated as follows: 1958 - in view of the slight fall in rubber prices between 1957 and 1958 and the fact that 1959 and 1957 wages are almost identical, 1958 wages are assumed to be a figure ($78) rounded down from the 1957 wage rate. 1951 and 1952 - estimated from details of union wage agreement in rubber industry for 1951 and 1952 for rubber price range of $1.50 - $2 per lb for 1951 and 80-90 for 1952. Checkroll tappers' wage for 1951 is $3.30, equivalent to $85.80 at 26 days a month and $74.10 for 1952. For most years tapper's wage is very close to overall average wage. Data from A.M.F. Gull, "Wages and Prices with reference to the Rubber Industry in West Malaysia" (University of Malaya, BA Graduation Exercise, Kuala Lumpur, 1967-8) p. 25.

5) 1947 calculated using 1948 weights, as no weights are given for 1947.

6) Wages for 1967 are calculated from HLS 1967 and 1968. No Ministry of Labour figures are available for 1962, 1963, and 1966, hence the use of RSH data. Where RSH data are used to calculate average wage (RSH gives only the total wage bill), the wage bill is first divided by 1.2 (see note 3).

b) Calculation of Average Wage, 1961

Below is set out the calculation of the average wage in the rubber industry for a sample year (1961).

(i) TYPE OF WORKER	(ii) AVERAGE MONTHLY EARNINGS ($)	(iii) PROPORTION OF WORKFORCE	(iv) ii x iii
Foremen	129	0.03	3.87
Tappers	86	0.63	54.18
Weeders	60	0.30	18.00
Arsenite Sprayers	103	0.01	1.03
Factory Workers	105	0.04	4.20
Total		1.01	81.28

$$\text{Mean Wage} = \frac{\sum iv}{\sum iii} = \$80.48$$

Sources and Notes: 1) AR, Ministry of Labour, FM, 1961.

c) Wages, 1911-1939, Federated Malay States

	(i) ESTIMATED TOTAL WORKFORCE	(ii) AVERAGE MONTHLY WAGE ($)	(iii) ANNUAL WAGE BILL ($000)	(iv) ANNUAL WAGE BILL INCLUDING MANAGEMENT SALARIES ($000) (iii x 1.3)	(v) LABOUR BENEFITS ($000)
1910	115,601	6.0	8,323	10,820	...
11	149,081	10.3	18,492	24,040	3,991
12	169,997	11.6	23,730	30,849	4,787
13	179,477	10.0	21,473	27,915	4,362
14	...	9.0	...		...
15	160,552	8.9	17,133	22,273	3,508
16	178,472	12.3	26,290	34,177	4,520
17	201,331	12.8	30,812	40,056	4,891
18	181,676	13.9	30,406	39,528	4,827
19	213,415	10.1	25,930	33,809	4,534
1920	194,929	12.4	28,984	37,679	5,642
21	141,489	12.3	20,915	27,190	4,466
22	151,537	10.9	19,907	25,879	4,229
23	141,121	11.0	18,587	24,163	3,833
24	143,581	10.3	17,720	23,036	3,825
25	165,550	13.7	27,176	35,329	4,773
26	221,097	16.2	43,025	55,933	6,289
27	202,021	15.5	37,488	48,734	6,275
28	200,294	15.6	37,597	48,876	5,974
29	231,091	17.4	48,152	62,598	7,611
1930	151,340	9.7	17,532	22,792	4,104
31	126,668	8.9	13,541	17,603	2,925
32	111,844	6.1	8,160	10,608	1,713
33	123,924	8.3	12,308	16,000	2,260
34	161,408	8.9	17,159	22,307	3,219
35	145,899	9.0	15,773	20,505	3,369
36	153,455	9.5	17,542	22,805	3,702
37	199,199	11.5	27,498	35,747	5,863
38	170,932	10.1	20,629	26,818	4,567
39	174,084	11.3	23,637	30,728	5,224

Sources and Notes: 1) Column i from AR's, Department of Agriculture FMS for 1911-13, and 1915; 1916-30 from AR's Resident General/Chief Secretary FMS; 1931-32 from AR's Department of Labour, FMS; 1933-39 from RSH 1933-39. To 1932 the original figures include workers on estates growing crops other than rubber (usually about 10% of total). Figures in column i has been adjusted to include only rubber estate workers (see Appendix V - 6d).
2) Column ii calculated from daily wages, assuming 24 working days per month (in contrast to 26 for post-war years). Daily wages from same sources as labour force statistics to 1932, except for 1910 and 1914 wages which are from D.M. Figart, Plantation Rubber Industry in the Middle East, op.cit., p. 179. 1932-39 wages data are supplemented by information and fragmentary wage data from P.T. Bauer, The Rubber Industry, op.cit. and J.N. Parmer, Colonial Labor Policy and Administration, op.cit.
3) Conversion factor in column iii is arbitrarily assumed 1.3. It is thereby assumed that management salaries are higher in relation to estate workers than is the case in the years after the Second World War.
4) Labour benefits are assumed to be equal to 30% of the non-Chinese workers' wage bill. Chinese workers earned higher daily wages and did not receive non-monetary benefits. See P.T. Bauer, The Rubber Industry, op.cit., p. 219, who estimates that labour benefits add another third to the total wage bill.

d) Calculation of Average Wage 1917

Below is set out the calculation of the average wage for a sample year (1917).

	(i) NUMBER	(ii) MALES (i x 0.75)	(iii) MALE DAILY WAGE ($)	(iv) MALE ANNUAL WAGE BILL ($000)	(v) FEMALE (i x 0.25)	(vi) FEMALE DAILY WAGE ($)	(vii) FEMALE ANNUAL WAGE BILL ($000)
1. Non-Chinese Workers	165,518	124,138	0.40	14,301	41,379	0.30	3,575

	(i) NUMBER	(ii) DAILY WAGE ($)	(iii) ANNUAL WAGE BILL
2. Chinese Workers	55,240	1.00	15,909

Total Wage Bill, all Estates = $33,785 (in $000)

This wage bill includes wages paid to workers on a small number of coconut and rubber estates. To reduce it to rubber only, the wage bill is prorated by the acreage of rubber estates over total estate acreage. This is a crude method, which assumes labour expenditure per acre to be the same for all estate crops. Nevertheless, in the absence of better information, it gives an adjustment in the right direction.

		('000 ACRES)
FMS	Rubber Estate Acreage	612
	Coconut Estate Acreage	59
	Oil Palm Estate Acreage	0.4
	TOTAL	671.4

Rubber acreage ÷ total acreage = 0.912

0.912 x $33,785 = $30,812 = Rubber Estate Wage Bill (in $000)

After 1932 this proration is not necessary. Rubber and other acreage figures are from the AR's of Department of Agriculture, FMS, and Resident General/Chief Secretary, FMS, to 1932.

APPENDIX V - 7

TRANSPORT CHARGES TO PORT, 1916-67

	(i) TONS OF RUBBER CARRIED BY RAIL ('000)	(ii) RAIL RECEIPTS FROM RUBBER ($000)	(iii) REVENUE (CENTS PER LB.)
1916	67	515	1.8
17	...	...	...
18	87	775	2.0
19	118	1,009	2.0
1920	111	1,000	2.0
21	100	1,377	3.1
22	125	1,470	2.7
23	114	1,068	2.0
24	105	1,100	2.2
25	121	1,199	2.2
26	167	1,145	1.6
27	134	868	1.3
28	171	1,114	1.6
29	251	1,599	1.3
1930	205	1,231	1.3
31	174	827	1.1
32	184	678	0.9
33	210	974	0.9
34	251	773	0.7
35	201	779	0.9
36	204	806	0.9
37	271	1,039	0.9
38	196	759	0.9
39	207	848	0.9

	(i) CONT'D	(ii) CONT'D	(iii) CONT'D
1946	179	1,736	0.4
47	328	3,795	0.5
48	282	3,642	0.6
49	283	3,323	0.5
1950	343	3,944	0.5
51	288	4,050	0.6
52	243	3,314	0.6
53	277	3,703	0.6
54	300	3,599	0.5
55	315	4,075	0.6
56	299	3,978	0.6
57	321	4,412	0.6
58	312	4,447	0.6
59	371	5,075	0.6
1960	347	4,447	0.6
61	334	4,249	0.6
62	349	4,229	0.5
63	343	4,182	0.5
64	359	4,281	0.5
65	335	4,040	0.5
66	337	4,130	0.6
67	323	3,857	0.5

Sources and Notes: 1) In order to calculate unit transport costs (column iii) unrounded figures for columns i and ii were used.
2) All revenue and tonnage figures from AR's, Railway Department FMS 1916-39, and AR's of Railway Administration MU/FM/WM 1946-67.
3) Non-rail Transport charges are assumed to be the same as rail transport charges. Thus to obtain percentages of transport costs in gross output in Tables in the main text, transport unit values from column iii are divided by output unit values. It can be seen by comparison with Appendix V - 1 that in pre-war years railway rubber tonnage was in excess of estate output. The importance of rail transport declined in the period from 1946.

APPENDIX VI - 1

CALCULATION OF CAPITAL INTENSITIES AND RATES OF RETURN IN TIN, RUBBER, AND OIL PALM

a) Net Output and Non-Wage Value-Added

The first step is to estimate the proportions of total value-added (net output) and non-wage value-added (NWVA) in the gross output of each sector. These are as follows.

	NET OUTPUT	NON-WAGE VALUE-ADDED	SOURCE (TABLE)
Gravel Pump Tin	0.65	0.45	IV-11, 21, 23
Tin Dredging	0.70	0.55	IV-11, 15, 20, 23
Rubber Estates	0.75	0.35	V-18, 19, 20, 21
Oil Palm Estates	0.75	0.40	VI-3, 6, (and see below)

For oil palm, a wage bill calculated from employment and wage statistics from Tables VI-3 and 6 was taken as a proportion of output (from Table VI-3), having first been prorated by a management salaries correction factor, assumed to be the same as for rubber (Appendix V-6). Proportions of profits were estimated from Bevan and Goering "The Oil Palm in Malaysia", op.cit., p. 161.

b) Capital Costs

	SIZE OR CAPACITY OF PROJECT	TOTAL CAPITAL COST ($MIL)	SOURCE (TABLE)
Gravel Pump Tin	20,000 cu.yds/ month	0.15	IV-40
Tin Dredging	500,000 cu.yds/ month	11.00(including $2m. site costs)	IV-35
Rubber Estates	5,400 acres	8.31	V-37
Oil Palm Estate	6,455 acres	11.02	Appendix VIII-2

c) Table VI-8 Calculations

The dredging rate of return assumes capital costs are spread over two years and returns over eighteen years, making a total time horizon of twenty years. Gross output is assumed to be $6m. (500,000 cubic yards a month, with a recovery rate of 0.2 katis per cubic yard and a price of $500 per pikul). The recovery rate used is below the present rate (0.25 katis, from BSMI, 1968), but it has been falling and may be expected to fall further. The price is only slightly below the 1968 price ($565), and is arbitrarily assumed since there are no reliable published tin price projections, and since demand for tin has been strong in recent years. In view of the lower

price, profits are assumed to be 50% not 55% of gross output, before deduction of tax and duty.

The gravel pump rate of return assumes a ten year time horizon, with all capital costs in the first year. Although engines and some other capital items last longer than ten years, many others such as the palong, do not. Gross output is assumed to be $300,000 a year (20,000 cubic yards a month with recovery rate of 0.25 katis, and price of $500). Because of the lower price, profits are assumed to be 40% of output, not 45%. In view of the possible lack of accuracy of information on durability of equipment and on costs, the gravel pump mine returns was calculated only to a round figure, and should be treated with caution.

To calculate the capital-net output ratio for dredging and gravel pumping the gross outputs quoted above are multiplied by 0.70 and 0.65, respectively and divided into capital costs. For rubber and oil palm, project yields are assumed to be 1,500 lbs. and 1.5 tons of rubber and palm products per acre, respectively, at respective 1968 prices of 54 cents and $460.

To calculate non-wage value-added per worker, the NWVA proportions are multiplied by total 1968 values of outputs and divided by total employment.

APPENDIX VIII - 1 SAMPLE SURVEY OF INDUSTRY 4623, INDUSTRIAL MACHINERY AND PARTS

a) Introduction

In order to supplement official data in the Censuses and Surveys of Manufacturing Industries of West Malaysia a sample survey was undertaken of the engineering industry apparently most concerned with production for the export sector, Industry 4623, Industrial Machinery and Parts. A secondary purpose of the survey was to provide information about producers of gravel pump tin mining equipment, since these producers were too numerous to be interviewed in the same way as those of dredging, rubber and oil palm machinery.

It was decided to confine the sample to the states of Perak and Selangor, which in 1968 accounted for 44.8% and 37.4% of value added, and 47.5% and 34.7% of full-time employment respectively.[1] No other state had even a quarter of the output or employment of Perak or Selangor. Firms were picked by a random sampling procedure, from a list of firms in the industry, the list being kindly supplied by the Department of Statistics, Kuala Lumpur. The random sample was determined separately for each state, thus the results cannot properly be aggregated for the two states. This was decided because it was hoped to isolate expected differences in the engineering structure of the two states. The size of the sample, 20% of all firms in the industry in each state, was the largest possible in the time allocated to the survey (three weeks). In any case it would be difficult to determine a minimum sample size for given confidence intervals in view of the large amount of qualitative information required.

During the two weeks before the survey in each state every selected firm was sent an explanatory letter, in English and Chinese versions.[2] The decision to interview all selected firms was the result of advice by colleagues in the University of Malaya that local firms responded poorly to written questionnaires. Interviews were conducted over the period 5th to 10th November 1970 in Selangor and 30th November to 2nd December in Perak. In all cases it was attempted to obtain the basic quantitative information presented in Table 1 on main products, employment, and year of foundation. Most respondents spoke at least some English, but in a few cases it was necessary to resort to simple Malay and Chinese (Mandarin) learnt especially for the purpose. Where respondents were both co-operative and fluent in English, more general discussions about the industry were held, the results of which are incorporated in Section VIII - 2.

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[1] CManI, 1968

[2] I am grateful to Thian Thau Min of the University of Malaya for translating the English version into Chinese.

APPENDIX VIII - 1 TABLE 1

RESULTS OF SAMPLE SURVEY OF INDUSTRY 4623

	MAIN PRODUCT	PERCENTAGE TURNOVER OF MAIN PRODUCT	OTHER PRODUCTS, WITH % TURNOVER IN BRACKETS (WHERE KNOWN)	YEAR FOUNDED	NUMBER OF EMPLOYEES 1970	1965	1960	POSSESSION OF FOUNDRY
Selangor								
Firm 1	Chinese Mining Machinery	30%	Dredge Spares (25%) Engine Spare Parts	1941	45	45	45	Yes
2	"	90%	-	1957	60	60	60	Yes
3	"	"Most"	-	1930	30	40	30	Yes
4	Dredge Parts	60%	Chinese Mining Machinery (20%)	1920	20	30	25	Yes
5	Dredge Erection	"Most"	Other Structural Steelwork	1914	140	...	...	No
6	SMR Rubber Machinery	75%	Repairs and Odd Jobs	1946	35	29	24	No
7	Structural Steelwork	100%	(Includes oil palm mills, rubber factories, and quarry works).	1967	30	-	-	No
8	Sawmilling Machinery	"Most"	-	1960	9	...	...	No
9	"	100%	-	1946	35	20	9	No
10	"	"Most"	Rubber Creping Machinery	1949	32	30	28	No
11	Precision Tools	100%	-	1967	10	-	-	No
12	Repairs - diesel and excavators	"Most"	Hiring of Excavators	1957	10	...	...	No
13	Repairs - mine engine and pumps	40%	Engine Spare Parts	1960	13	7	...	No
14	Repairs - marine engines	75%	-	1960	23	12	6	No
15	Repairs and General Odd Jobs	100%	-	1950	2	6	6	No
16	"	"	-	1959	5	2	2	No
17	"	"	-	1966	3	-	-	No
18	"	"	-	1963	6	...	-	No
19	"	"	-	1966	2	-	-	No
20	"	"	-	1946	3	...	...	No
21	"	"	-	1969	4	-	-	No
22	"	"	-	1967	6	-	-	No
23	"	"	-	1965	8	-	-	No
24	"	"	-	1950	10	10	10	No

TABLE 1 (Continued)

	MAIN PRODUCT	PERCENTAGE TURNOVER OF MAIN PRODUCT	OTHER PRODUCTS, WITH % TURNOVER IN BRACKETS (WHERE KNOWN)	YEAR FOUNDED	NUMBER OF EMPLOYEES 1970	1965	1960	POSSESSION OF FOUNDRY
Perak								
Firm 1	Chinese Mining Machinery	95%	-	1935	54	...	...	Yes
2	"	90%	Dredge Spares	1922	52	80	30	Yes
3	"	90%	-	1942	40	100	40	Yes
4	"	50%	Sawmilling Machinery (30%) Rubber Rollers (20%)	1955	20	15	12	No
5	"	60%	House Pilings, Gears	1965	12	...	-	Yes
6	"	"Most"	Rough Castings for Machining by Other Firms (20%)	1955	20	...	...	Yes
7	Dredge Parts	50%	Chinese Mining Machinery (30%)	Before 1914	30	30	30	Yes
8	Structural Steelwork (excluding oil palm)	100%	-	1963	34	...	-	No
9	Rubber Creping Machinery	90%	Repairs (10%)	1930	28	35	35	Yes
10	Repairs - Tractors & (mostly for saw mills)	"Most"	-	1968	10	-	-	No
11	"	80%	Repairs of Mine Water Pumps	1964	15	...	-	No
12	Repairs - Chinese Mining Machinery	80%	-	1938	6(sic)	30	40	No
13	Repairs and General Odd Jobs	100%	-	1960	3	...	...	No
14	"	"	-	...	5	...	...	No
15	"	"	-	1966	5	...	...	No

APPENDIX VIII - 2 PALM OIL FACTORY CAPITAL COSTS

Following the procedure used in Chapter IV and V, this Appendix sets out oil palm factory capital requirements, concentrating on the relative sizes of local and foreign payments. Part b sets out factory capital costs. It is preceded by a discussion, in Part a, of the relative importance of factory and field establishment costs in total capital costs. The effects on the Malaysian economy of local payments for mill construction have been examined separately in Chapter VIII.

a) The Relative Importance of Field and Factory Establishment in Total Capital Costs

Table 1 shows field and factory capital costs for oil palm operations. It is interesting to note how much more important is the factory cost than is the case in rubber, as set out in Table V - 39. This is partly because the lower gestation period of oil palm (four years instead of seven) reduces field cost. Also the factory cost of oil palm per acre served is over three times that in rubber cultivation.[1 2]

APPENDIX VIII - 2 TABLE 1 FACTORY AND FIELD ESTABLISHMENT COSTS FOR OIL PALM

	FACTORY CAPACITY (TONS FFB PER HOUR)				
	10 TONS	20 TONS	30 TONS	40 TONS	50 TONS
Mean Factory Capital Costs	$2.09m.	$3.35m.	$4.90m.	$5.53m.	$7.16m.
Acreage Served by Factory	3220	6455	9670	12900	16120
Total Field Establishment Costs of Acreage Served by Factory (at $1190 per acre)	$3.83m.	$7.67m.	$11.51m.	$15.35m.	$19.18m.
Total Capital Cost	$5.92m.	$11.02m.	$16.4m.	$20.88m.	$26.34m.
Factory Cost as % of Capital Cost	35.3%	30.4%	29.9%	26.5%	27.2%

Sources and Notes given on page 507.

1 For an acreage of say 10,000, oil palm factory costs (for 30 tons/hr. mill) are over $500 an acre, and $145 for rubber (for a 40 tons/day factory). Figures calculated from Table 1 of this Appendix and from Table V - 39.

2 As an aside, it is also worth pointing out that factory costs tend to be spread into the period when the crop has started to yield. Thus, although factory establishment costs are capital costs in the sense of being purchases of capital equipment they are not entirely capital costs in the economic sense of a negative cash flow.

Sources and Notes: 1) Mean factory capital costs are calculated on a per ton basis from the mills in Tables 2 to 4, together with five other mills, as follows:

1. $2.6m. for 10 tons, rising to $3m. for 20 tons, $4.2m. for 30 tons, $4.9m. for 36 tons, $5.5m. for 38 tons.
2. $4.5m. for 40 tons.
3. $2.8m. for 15 tons, rising to $3.3 for 20 tons, $5.1 for 30 tons, $6.0m. for 40 tons, $7.2m. for 45 tons.
4. $2.5m. for 20 tons, rising to $4.0 for 40 tons.
5. $2.6m. for 15 tons.

Costs of factory 1 from interview with FLDA, October 1970. Factory 2 costs from interview in Malaysia, October 1970. Factory 3 from FLDA, Jengka Triangle Report Volume II, Resources and Development Planning, op.cit., p. 186. Factory 4 from I.W. Cooper and J.W.L. Bevan "Some Factors to be considered when Planning the Organization of Processing of Palm Oil Products" in Incorporated Society ofPlanters, Oil Palm Development in Malaysia, op.cit., p. 128. Factory 5 from J.W.L. Bevan and T.J. Goering "The Oil Palm in Malaysia. An Estimate of Product Prices and Returns to Investment", in ibid., p. 161.
2) Field Establishment Costs are from Bevan and Goering, op.cit., p. 161, rounded from $1188, including $255 for general charges (including housing).
3) Acreages served by factory assume 3.1 tons FFB/hour capacity per 1000 acres. This assumes 400 hours a month factory operations, with one eights of annual output in peak month. A peak yield of 10 tons FFB per acre is assumed (Bevan and Goering, op.cit., p. 161).
4) Costs are undiscounted.

b) Oil Palm Factory Capital Costs

Detailed breakdowns of capital costs were collected through personal interviews for three oil palm mills built or planned in Malaysia during the five years to 1970. Tables 2 to 4 set out these details for the three mills. They are all of relatively large size, and are typical of the many mills now being built in Malaysia in the 40 to 60 ton FFB/hour capacity range.[1]

The data given here show the local content of the three mills by stations, and also by capacities for Mill A.[2] For each mill, local content is over 40%, even after allowing for indirectly imported steel. Imported items in all three cases are concentrated in a small number of stations - the pressing station and the boiler and power houses. As is shown in Chapter VIII, these items are not available locally. Probably the absolute maximum local content, given existing engineering capacity in Malaysia, is that achieved recently by a local design consultant.[3] In this case a 40 ton/hour mill was built for $4.5m. of which only $1.5m. (33.3%) was imported. Unfortunately a detailed set of costs for this mill could not be obtained. For MillA, the digesters, presses, boilers and the steam engine for the power house alone came to almost $1,5 with no ancillary equipment. Thus the $1.5m. estimate for imported content for the design consultant's mill seems low.

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[1] Before 1970 only two mills to my knowledge were as large as 40 tons capacity.

[2] For purposes of design and cost estimation a mill can be split into a number of stages, or stations. Each station corresponds to a stage in the production process of FFB into palm oil and kernels. Each station is usually costed separately.

[3] Design consultants and their role are discussed in Chapter VIII.

APPENDIX VIII - 2 TABLE 2

CAPITAL COSTS : PALM OIL MILL A

(Percentage Local Content by Stations and Capacities)

CAPACITY (TONS FFB PER HOUR)	(i) 0-10	(ii) 10-20	(iii) 20-30	(iv) 30-35	(v) 35-40	(vi) TOTAL 0-40	(vii TOTAL COST PER STATION ($000)
Station							
1. Bunch Reception & Storage	76.8	68.0	70.6	68.0	NE	71.3	280
2. Threshing	58.8	NE	53.1	NE	NE	56.1	170
3. Bunch Incineration	98.1	NE	100	NE	NE	98.8	100
4. Pressing	15.5	11.4	15.5	14.4	6.7	13.4	1140
5. Clarification	28.3	-	45.2	-	NE	18.9	220
6. Depericarping	70.9	NE	70.9	NE	NE	70.9	130
7. Kernel Recovery	64.5	100	63.6	100	NE	66.1	360
8. Boiler House	6.9	NE	7.6	77.6	NE	7.3	840
9. Boiler Water Treatment Plant	4.4	NE	0	NE	NE	4.1	50
10. Power House	0	0	0	0	NE	-	470
11. Electrical Installation	82.4	100	83.3	100	100	89.4	240
12. Piping and Bulk Storage	99.5	100	99.4	100	100	99.7	330
13. Factory Buildings	100	NE	100	NE	NE	100.0	210
14. Civil Engineering	100	100	100	100	100	100.0	330
15. Miscellaneous	71.8	68.3	74.7	80.8	57.8	72.2	1060
TOTALS	52.7	39.5	51.8	35.6	41.4	47.7	5930

Sources and Notes: 1) NE = no expenditure for the station and capacity shown.
2) Columns ii to v show the local content of costs of expansion beyond the initial 10 ton FFB/hr. stage.
3) Miscellaneous includes, inter alia, freight, erection, engineering fee, insurance.
4) Figures from interview with manufacturer in Malaysia October 1970.

APPENDIX VIII - 2 TABLE 3 ITEMIZED CAPITAL COSTS : MILL B

(Percentage Local Content by Stations)

Station		(i) % LOCAL CONTENT	(ii) TOTAL COST ($000)
1.	Reception	90.0	400
2.	Sterilization	50.0	400
3.	Threshing	55.6	450
4.	Pressing	14.3	700
5.	Clarification	28.6	350
6.	Depericarping	62.5	200
7.	Kernel Recovery	46.0	500
8.	Oil Storage	99.6	700
9.	Steam Plant	31.3	1200
10.	Power Plant	2.4	250
11.	Piping, Valves, etc.	16.7	300
12.	Water Supply	50.0	200
13.	Electrical Installation	40.0	300
14.	Buildings	85.7	350
15.	Civil Works	100.0	400
16.	Fees	50.0	250
TOTAL		45.3	6950

Sources and Notes: 1) Mill capacity: 54 tons FFB per hour.
2) Only for item 14 is cost of imported structural steel known to have been deducted (estimated by manufacturer at 100 tons, at say $500 a ton). If structural steel for complete mill is estimated at, say, 600 tons (less 100 already included = 500 tons) at $500 a ton, total local is reduced to 41.8%.
3) Information from interview with a manufacturer in Malaysia, October 1970.

APPENDIX VIII - 2 TABLE 4 ITEMIZED CAPITAL COSTS : MILL C

(Percentage Local Content by Stations)

Station	FIRST STAGE % LOCAL CONTENT	FIRST STAGE TOTAL COST ($000)
1. Preliminaries	44.3	264
2. Weighbridge	-	38
3. Loading/Storage	99.1	213
4. Sterilization	78.4	138
5. Threshing	81.1	205
6. Pressing	27.2	467
7. Clarification	51.3	190
8. Storage	98.4	190
9. Depericarping	76.6	65
10. Kernel Recovery	56.9	202
11. Steam Plant	25.1	995
12. Power Plant	14.9	303
13. Pipes, Valves, Water, etc.	92.3	143
14. Electrical Installations	55.2	165
15. Buildings	100.0	390
16. Civil Works	100.0	443
TOTAL	57.6	4412

Sources and Notes: 1) Local contents includes imported structural steel say 500 tons at $500 = $250,000. This reduces local content to 52.0%.
2) First stage capacity is 21 tons FFB per hour. Second and third stages are 39 and 40 tons costing an additional $2.12m. and $0.516m. respectively. Local content figures are not available for these expansions.
3) Figures are from private communication, Federal Land Development Authority, Kuala Lumpur, October 1970. Figures are not actual mill costs but "averaged" tender prices. The writer was not of course given access to actual tender prices.